SCIENTIFIC AMERICAN

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FIRELESS LOCOMOTIVES FOR STREET RAILWAYS.

Some time ago we gave illustrations in the SCIENTIFIC AMERICAN of examples of the fireless locomotives as then used in New Orleans. The motive power of these engines is derived from a supply of hot water with which a large tank on the engines is charged from stationary boilers. These experiments were attended with more or less success, so that about a year and a half ago the Crescent City Railroad Company of New Orleans gave an order to Mr. Theodore Scheffler, a mechanical engineer of Paterson, N. J., for eight engines of this kind to be built from his designs. These engines were built and have now been at work for about a year. The engraving, which is from the *Railroad Gazette*, represents one of them without its cab. The construction is thus shown more clearly than it would be with the cab on the engine.

It has a cylindrical tank, 31 inches in diameter and 9 feet long, for holding the hot water. The capacity of this tank is about 300 gallons. The driving wheels are 30 inches in diameter, and the leading wheels 20 inches with a wheel base of 5 feet 7 inches. The cylinders are 4½x10 inches. The valve gear consists of a main valve, which works full stroke at all times, and controls the exhaust, with a steam valve on top worked by a link, which governs the admission. Both valves are, however, worked by the same link. This valve gear has been patented by Mr. Scheffler, who has promised us a detailed drawing, an engraving of which we expect to publish soon. The whole weight of the engine with the tank full of water is 8,700 lbs.

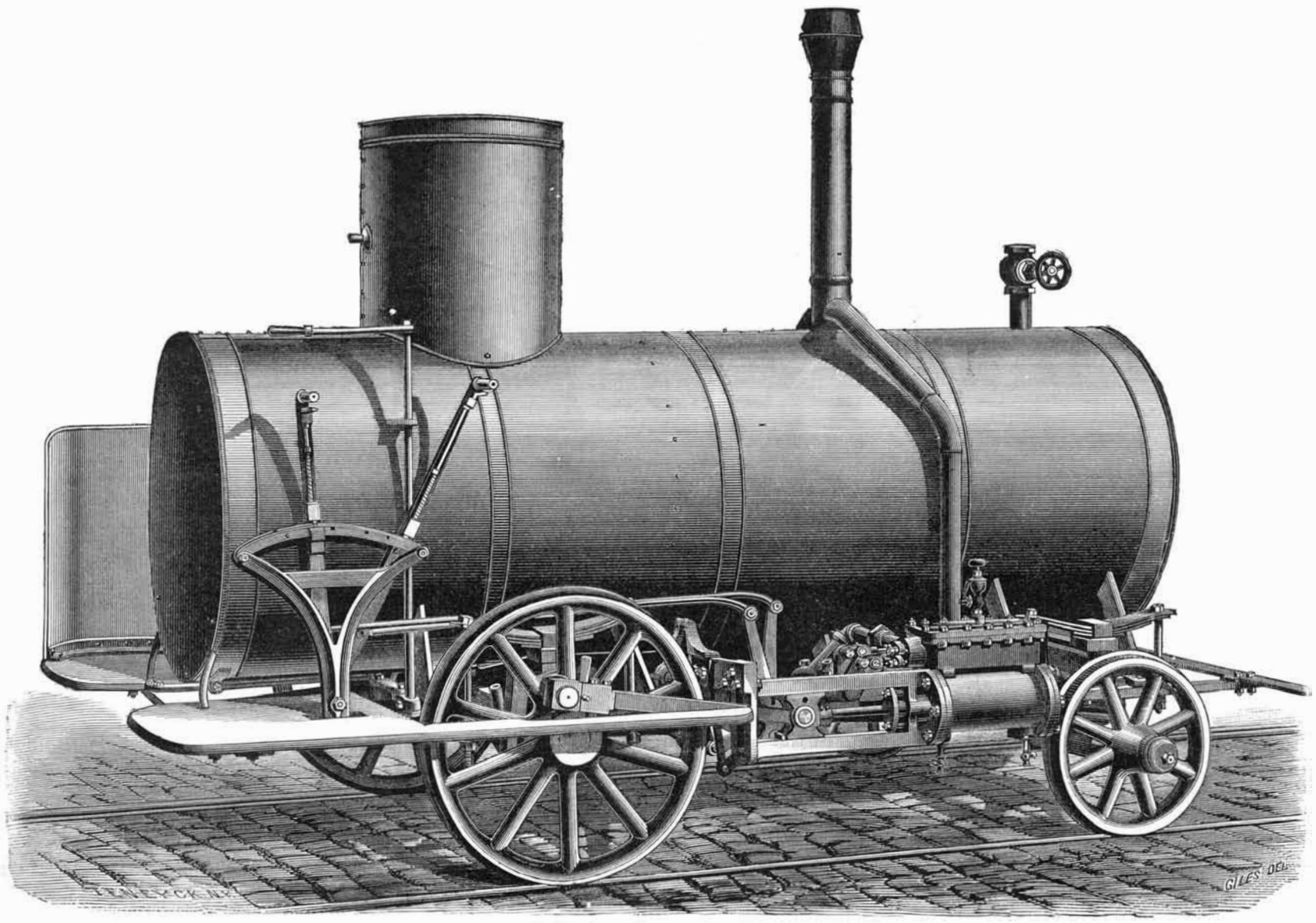
The tanks are charged with water from a stationary boiler which is heated up to a temperature due to a pressure of 220 lbs. per square inch. With such a charge the engines run about six miles with an ordinary loaded street car; the pressure in the tank at the end of the run is then reduced to about 40 lbs.

It is of course important to use the steam with the utmost economy; and as the pressure varies between such wide limits, the valve gear referred to was employed in order to regulate the supply of steam required by the cut-off alone, and thus use the steam in the least wasteful way. The separate cut-off valve gives a much wider range of cut-off, and thus permits a much more perfect adjustment of the supply of steam than does the ordinary link motion with a single valve.

The tank and the other parts of the machine are all protected as perfectly as possible from radiation, and every possible device is employed to use the steam economically.

The stationary boilers used are of what is called the sectional or "tubulous" variety. They consist of sections of 68 two-inch inclined tubes, 7 feet long, which are attached to ordinary tube plates. On the outside of each of these plates is bolted a hemispherical cast iron cap, which incloses the ends of the tubes. Each cap is connected with a horizontal steam drum placed above the tubes, 2 feet in diameter by 11 feet long. The water is of course in the inside of the tubes, between which and the hemispherical caps and also from the latter and the steam drum there is a free communication. Owing to the inclined position of the tubes there is a rapid circulation of the water, and, consequently, it is not surprising that these boilers should be very efficient.

Although these engines have been working for nearly a year, we have not been able to get very complete information of their performance. One difficulty encountered was in charging the boilers with water all heated to a uniform temperature of 390 degrees, which is that of steam of 220 lbs. pressure. Of course the water in the boiler, of whatever temperature it happens to be, would rush into the tank as soon as communication was opened between the two. It is extremely difficult to have all the water in any boiler heated to a uniform temperature, and therefore that with which the tank is filled is usually below the temperature due to the pressure in the boiler. At first sight it might be supposed that hot steam could be admitted into the water with a perforated pipe or other means, and thus heat the water; but when this was done it was found that the upper stratum of water would thus become heated up to the temperature of the steam, or near to it, and that enough steam would soon escape to the surface to make the pressure in the tank on top of the water equal to that in the boiler, after which the flow of steam into the tank either ceased or was very slow, while at the same time the lower stratum of water remained comparatively cold. This difficulty could probably be removed by some means, but it is one which has been encountered and which has interfered seriously with the success of the engines. At any rate it was found difficult to maintain a pressure in the tank equal to the boiler pressure after communication between the two was cut-off. Usually in running from the stationary boilers to the place where the engine was attached to the car, the pressure would fall from 220 to 190 lbs., but the engine would then run a distance of 3½ miles and have 100 lbs. pressure in the tank at the end of that distance. With 80 lbs. pressure the engine would pull a car while the steam was cut off at 2 inches, or one fifth of the stroke. It should be added that, as the city of New Orleans is built on a level plain, there are no grades of any consequence on this line, but it has curves of 35 and 40 feet radius, around which the engines run without difficulty.



FIRELESS LOCOMOTIVE FOR STREET RAILWAYS

Invisible Ink for Postal Cards.

The *Deutsche Illustrirte Gewerbezeitung* proposes the use of what may be called "postal card ink," for messages which are sent on such cards or otherwise unsealed. A solution of nitrate or chloride of cobalt, or chloride of copper, mixed with a little gum or sugar, produces a "magic ink," which is made visible by warming, either by holding against the stove or over a burning match. Potassium ferrocyanide in solution may also be used; but this requires a developer, for which either copper or iron sulphate may be employed. With the former the writing will appear in brown, and with the latter in blue color.

DURABLE PAINT FOR OUTDOOR WORK.—Grind powdered charcoal in linseed oil, with sufficient litharge as a dryer. Thin for use with boiled linseed oil.

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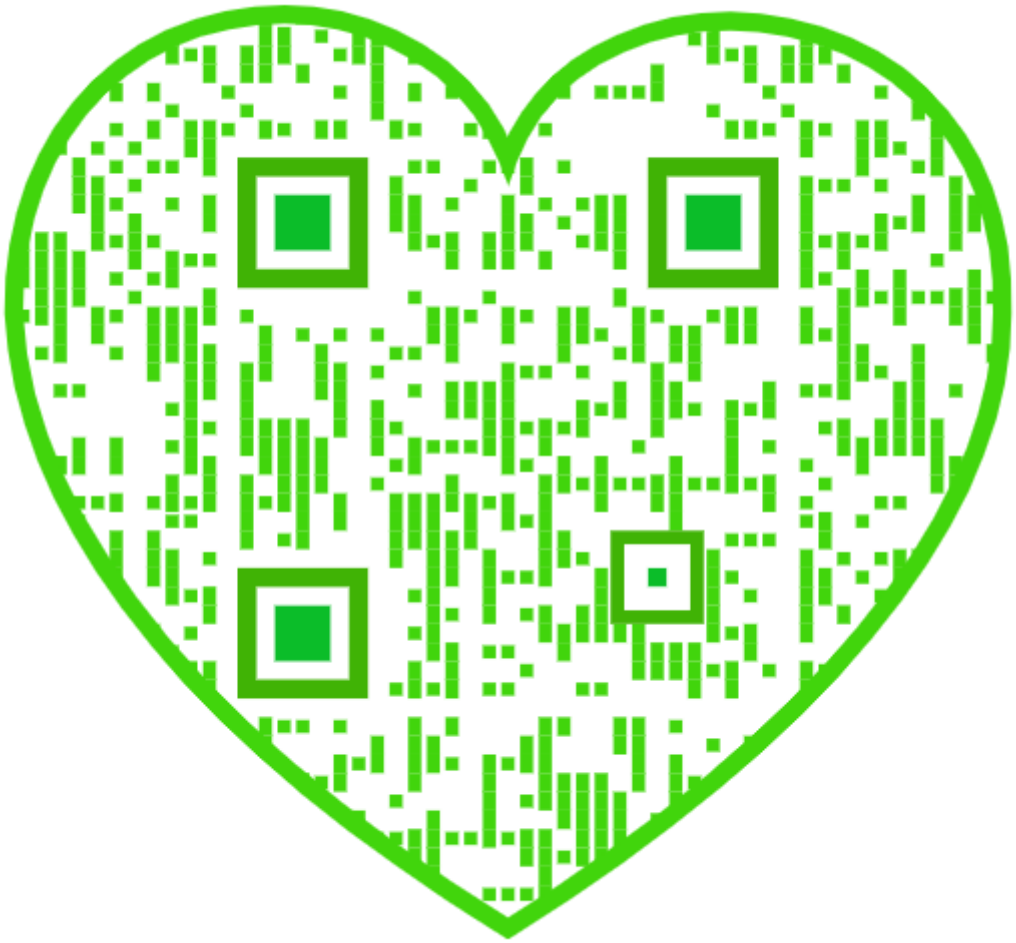

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VOL. XXXVII., No. 16. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, OCTOBER 20, 1877.

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STAR, NEBULA OR METEORITE.

The spectrum of the new star in *Cygnus*, discovered by Professor Schmidt, in Athens, in November last, has been made the subject of investigations by Herr Vogel, and in his recently published report he states that the spectrum was a continuous one showing numerous dark lines and bands, and several bright lines. It decreased rapidly in intensity, and at three months after the star was discovered became very faint. The most important phenomenon, however, exists in the presence of the bright lines. These, in some few star spectra, are believed to result from gases which break forth from the interior of the luminous body, where the temperature is higher than at the surface, and in fact constitute a repetition of the same phenomenon seen in the spectra of solar spots where incandescent hydrogen, rushing out of the hot interior, becomes visible above the colder spots through the hydrogen lines turning bright. Another explanation is that the atmosphere of a star, consisting of incandescent gases, as is the case in our sun, is, on the whole, colder than the nucleus, but with regard to the latter is extremely large. Herr Vogel prefers the last mentioned hypothesis and in further explanation refers to a theory proposed by Zoellner and deduced from Tycho's observations—which is that upon the surface of a star, through the constant exhalation of heat, the products of cooling, which in the case of our sun we call sun spots, accumulate in such a way that, finally, the whole surface of the body is covered with a colder stratum, which gives less light or none at all. Through a sudden and violent tearing up of this stratum the interior incandescent materials which it incloses must naturally break forth, and must, in consequence, according to the extent of their eruption, cause larger or smaller patches of the dark envelope of the body to become luminous. To a distant observer such an eruption from the hot and still incandescent interior of a heavenly body must appear as the sudden flashing up of a new star. Herr Vogel thinks that the spectrum shows beyond doubt that the decrease in the light of the star is in connection with the cooling of its surface.

Herr Vogel's investigations were completed in March last, and since then remarkable changes have occurred in the spectrum. The star, when discovered, was of the 3d magnitude, and is now less than the 10th. On September 3d it was discovered that its continuous spectrum had entirely vanished, and that all the colors save one had disappeared. On the following day Lord Lindsay, at his observatory in Scotland, obtained measurements of the wave lengths of the bright lines and found the wave length for the nucleus to be in millionths of a millimeter, 498·6, and with the extreme limits of the spectrum, between 500·8 and 493·5. In a recent letter to the London *Times*, Lord Lindsay points out that these lines are probably identical with the lines, measured by D'Arrest, in the spectra of the nebulæ in 1872, and adds that 'we have the extraordinary case of a star appearing suddenly in the heavens, giving a bright line spectrum, proving incandescence, and in the course of a few months its light becoming purely monochromatic. There is little doubt but that this star has changed into a planetary nebula of small angular diameter, though such a result is in direct opposition to the nebular hypothesis."

Professor Lockyer, in a communication to *Nature*, disagrees with both of the disagreeing doctors above quoted. He says if any star were to become a "world on fire," or in other words should have its incandescence increased, that thousands of years would be necessary for the reduction of light to its original intensity. Mr. Croll has recently shown that if the incandescence observed came for instance from the collision of two stars, each of them half the mass of the sun, moving directly toward each other with a velocity of 476 miles per second, light and heat would be provided which would cover the present rate of the sun's radiation for a period of 50 million years. Now the reduction of light of the new star was exceedingly rapid, so that, argues Professor Lockyer, we are driven from the idea that it was produced by the incandescence of any large mass of matter. It might be due, however, to that of a small mass of meteorites, and he goes on to show that such a mass at a temperature higher than that found to exist in a comet's head would give the hydrogen spectrum which was discovered with such richness in the spectrum of the new star, and which is represented in the spectra of most nebulæ. If further we accept the bright line observed in the star to be veritably the chief nebula line, then, as it is well known that within certain limits the lines in the spectrum of a compound body get brighter with decrease of temperature (because at the higher one the compound almost entirely ceases to exist as such, and we get the lines of its constituents), it is a fair theory to suggest that the nebula line may belong to a compound, which may contain hydrogen as one of its constituents. To sum up the new star is (1), according to Vogel, an old star cooled and now breaking out again; (2) according to Lord Lindsay, a nebula; (3) according to Professor Lockyer, meteorites. Views could scarcely be more dissimilar, and as in the famous Reynolds, Henry, Tyndall, controversy on sound in the atmosphere, three most learned of doctors once more differ. Meanwhile, if any other astronomer wishes to investigate the subject, he will find the star during the present year in right ascension 21h. 36m. 52s. and declination north 42° 16′ 53″. Its magnitude is 10·5, and it is of a faint blue color situated near another star of the same size rather red. It will be visible, says Lord Lindsay, with a 5 inch telescope, and the spectrum can be seen by a small direct vision prism outside the eye piece.

PRACTICAL EVOLUTION.

It has been reserved for a German lady, Fraulein Marie Von Chauvin, to accomplish one of the most remarkable feats in evolution on record—the changing of an amphibious gilled double-breathing animal into one that is a lung-breathing and land-inhabiting. The subject was the Mexican gilled salamander or axolotl. As far back as 1867 Dumeril noted that, out of many hundred of these creatures in the Jardin des Plantes in Paris, thirty lost their gills and assumed the form of the distinct amblystoma, a true land salamander, breathing air only by lungs. No cause could be assigned for this change, as all the axolotls were exposed to precisely similar conditions. Nor did the excision of the gills of one that had not changed throw any light on the matter, because a new set of gill tufts soon grew out again.

Fraulein Van Chauvin owes her repeated success to gradually accustoming the animal to life on land and exercising constant care as to its health and diet. Five strong axolotls were selected and were first kept in shallow water. Here they did not thrive, and the bolder measure of putting them directly on land was resorted to. Tepid baths twice a day kept up cutaneous respiration, and during the intervals between the baths wet moss was packed against the bodies. The mode of feeding was ingenuity itself. An earth worm was inserted in the axolotl's mouth as far as possible. Then the worm's tail was pinched until it wriggled so far down that the axolotl was obliged to finish the swallowing whether he liked it or not. Three of the animals persistently ejected their food, and, after fifty days' sojourn on land, died, or rather committed suicide, by starvation. The survivors, however, even after a few days showed a marked decrease in size of gill tufts and tail fin; before long, when put in water, they struggled to get back to land. Further changes went on; the skin was cast repeatedly, the gills slowly disappeared, and the gill clefts closed. The eyes became larger, and the skin, from being black and shiny, turned brownish violet black with yellow spots. Finally, the complete amblystoma form was assumed and with the amblystoma nature, the animals developing an astonishing greediness.

It is stated that the gills and tail fin seemed to shrivel by actual drying, through the action of the air, and that they were not absorbed by the vital processes of the animal itself. This is considered by Professor Huxley to be a most interesting point, as it shows how the first air-breathing amphibia may have been evolved from double breathers by a succession of dry seasons, that is, by purely mechanical causes.

THE ABOLITION OF MODELS.

The recent fire in the U. S. Patent Office destroyed about one hundred and thirty-six thousand old models, forty-nine thousand of which belonged to rejected cases. The loss is of no great importance, as, at the present rate in which models are being sent to the Patent Office—some twenty thousand a year—but a short time will elapse before the places of those burned will be supplied. In one respect, the conflagration may lead to a good result, as it makes an excellent opportunity for Congress to amend the patent laws by dispensing with the present system of official examination, and also with the requirement of models. The latter chiefly benefit the Patent Office examiners, and that in no wise materially or indispensably. On the other hand, they are a source of expense to inventors, often largely augmenting the cost of a patent and increasing the hardships of those who have already resorted to self-denying expedients to raise the funds to pay the regular fees. In this case, to abolish models would tend to stimulate invention.

When our patent laws were enacted in 1790, the model was a useful provision. Knowledge of the art of drawing was not widespread, and the number of devices patented was so small—the total number of patents in 1791 was 33, and in 1792, 11—that perhaps the best way to make the invention known was to produce it in miniature and display it in the capital city of the country. But now, when not only the number of patented devices has so enormously increased, but also the means of spreading information concerning them in almost like proportion, when the inventor can obtain at moderate cost accurate drawings and exact descriptions of his device, or can himself easily acquire the requisite draughting skill, the model plays little part in conveying the idea to others. Photography, unimagined when the patent laws were framed, now admits of the production of the most minute and perfect representations of inventions; and by the various processes of photo-engraving, etc., drawings and plans can be multiplied indefinitely.

Models, as records, but poorly fulfil their purpose. They occupy large spaces, necessitate especial care for their preservation, and, as the past fire shows, furnish an enormous mass of dry painted and varnished combustible matter, which burns like tinder. There is more sentiment than sense in the oft-repeated assertion that they constitute a great national museum, wherein the rise and progress of American invention can be studied. As for any one overhauling the chaos on the Patent Office shelves, examining even each specimen of a class, and discovering in each the peculiar advance which it may shadow forth, it is simply a physical impossibility. Long rows of models look impressive, and the average visitor is quite willing to let his imagination have free rein as to their signification; but the best that can be truly said of them is that, while some are intrinsically interesting as historical relics, the majority constitute a monument showing only in the aggregate how prolific is the genius of the American inventor. In Europe, where a patent system has existed for nearly three enturies,

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and in other countries, models are not generally required, and the necessity for them has not been found to exist.

In brief, they have come to bear the same relation to our patents as does the pound or so of yellow wax which the English fasten to their patent document. The wax is of no use, neither is the toy model, except that both tend to create an impression (literal and metaphorical) of useless formality.

POSTAGE STAMP INVENTIONS.

We have heretofore called attention to the need of an in vention in postage stamp cancellation, whereby the fraudulent re-use of stamps can be surely prevented. A considerable amount of ingenuity has been expended in this line, but up to the present time, we believe that no method, sufficiently effective and practical for adoption by the Post Office Department, has made its appearance; and the important problem still remains unsolved. For the benefit of those who may wish to study the subject, we will briefly recapitulate the general nature of the principal devices that have, thus far, been produced.

1. Coupon stamp. A stamp partially gummed, one end to project from the letter, the stamp to be cancelled by tearing off the projecting end. A modification consists in leaving the center portion of the stamp ungummed; center to be torn out by an instrument, and cancellation thereby effected.

2. Cancelling the stamp by means of indelible ink. Cancelling by means of ink of same kind as that used in printing the stamp. Cancelling by means of chemical ink.

3. Cancelling by means of instruments that cut the face of the stamp.

4. The use of stamps so made and printed that, on removal of the stamp, the color or ink is stripped from the stamp and left adhering to the envelope.

5. Combining explosive materials with the gum of the stamp, in such manner that, when the stamp is struck by a suitable instrument, an explosion results and the face of the stamp is burned.

6. Cancelling by means of red hot irons, or other apparatus for charring the face of the stamp.

7. Printing the stamp with chemically prepared ink of such a nature that, when warmed up to a certain degree of heat, the face of the stamp is permanently changed in color.

8. Elongating the envelope, placing the stamp on the elongated part, cancelling by punching through the stamp and envelope.

We do not wish to be understood as saying that none of these methods can be made effective; on the contrary, the probability is that relief will be found either in the perfection of some one of these plans, or in a combination made therefrom.

At the present time, the method of cancellation is so defective that thousands of stamps can be quickly cleaned, so as to look like new, by means of a bit of rubber or a damp cloth.

Moreover, it is to be remembered that there are some thirty-seven thousand post offices now open in the United States; and that the department has no means whatever of detecting the fraudulent re-use of old stamps therein. Any postmaster or his boy assistant may remove the clean stamps from the deposited letters and substitute old cancelled stamps, that are not even washed. The department is, at present, utterly unable to detect or stop this criminal practice. Herein is the answer to the question sometimes asked, "What becomes of the millions of old postal stamps?" in the collection of which certain parties, in various localities, are often so industriously employed.

The importance of a new invention that shall put a stop to stamp frauds will be understood when we remember that the value of the postal stamps now yearly sold in this country is about twenty millions of dollars, and the aggregate of stamps annually issued is seven hundred millions in number.

THE BORAX MINES OF NEVADA.—A VALUABLE DISCOVERY.

Many of the most wonderful and valuable discoveries and inventions, both ancient and modern, have been accidental. Notable instances will be readily called to mind by the intelligent reader, not only of the discovery of gold and other mines of great value, but also the germs of such great and useful arts and inventions as printing, steam, electricity, and various kinds of mechanism. Among the modern and indeed recent discoveries of great value to mankind, one in our country is particularly noteworthy. It is that of the discovery of a mine or vast bed of borax, by which a most useful and necessary article, instead of being an expensive luxury as formerly, is rendered so cheap as to bring it within the means of all classes.

This remarkable discovery was made in Esmeraldo County, Nevada, some four years ago, by a young man who was prospecting for gold and silver mines. While thus engaged, traversing mountains, cañons, and valleys on horseback, he saw, in a valley known as Teel's Marsh, what appeared to be a vast bed of white sand, resembling dry sea foam, The appearance was so novel and singular that he dismounted and descended to prospect the object. Upon arriving at the place, he found it to be the bed of a dry lagoon with the appearance of having been dry for centuries. Walking cautiously over the place, he found the surface to be soft and clayey, and often sunk ankle deep. After an examination of the curious clayey deposit he put several handfuls into his pockets, mounted his horse, and returned across the mountains to his home in Columbus. There he handed the contents of his pockets to an assayer, who, after analysis, pronounced it the richest sample of borax he had ever seen. This fact at once created great excitement, and no little expense attended the necessary claiming, etc., on the part of the fortunate discoverer. It soon proved to be an enormous lagoon or deposit of crude borax, two and a half miles wide, and five or six in length. It was more than one man could properly manage, so a brother was sent for. and the two (now widely known as the Smith Brothers, of Nevada and New York) worked with a will, sparing neither time nor money until the whole deposit was their property, and its wealth being developed. They at once obtained boilers, tanks, crystallizers, etc., from Chicago, and commenced operations. The result is that, in the course of three or four years, the brothers have perfected an immense establishment and are producing an enormous quantity of a chemically pure article of borax, which stands first, and is in demand in every household, to whom it is supplied by grocers and druggists throughout the country. So important has this new industry become that the eminent house of W. T. Coleman & Co., New York and San Francisco, some time ago became the sole agents for the article, and they are now pushing its sale in all parts of the world. We are indebted to them for the foregoing particulars.

The most wonderful part of our story is that the vast deposit of borax in Teel's Marsh reproduces itself every two or three years, so that the supply will continue inexhaustible. This fact (and the additional one that the article has been put at the lowest figures) must prove a great benefit and blessing to the people, for borax has become indispensable for many purposes, being much used in the arts, the household, and as a hygienic remedy. Indeed, the uses of borax are so varied, and its properties so valuable, that those who have thus cheapened its production—by discovery and improved preparation—are entitled to rank among the few who have bestowed lasting benefits upon mankind and the world.

PROTECTED WORKING MEN.

A correspondent, who states that he is a railway workman, sends us quite a lengthy letter of dissent from the views expressed by us to the effect that working men should learn to live on what they can honorably earn, and to adapt themselves to the altered conditions of the labor market, brought about by the general shrinkage in values and financial stringency. Our correspondent's points are, first, that railway companies and other large concerns are in the habit of employing men from youth up at special work, until such men "become almost helpless when thrown out of their accustomed employment," and then, while the employers grow richer and stronger, they reduce the wages of their employees until the latter "sink gradually down to the level of slaves." That such concerns are morally obliged to look after the well-being of their employees. Second, that, as in this country part of the population "are driven to starvation and despair," and "cannot get the necessaries of life easier than an isolated man in the wilderness," then a bad state of things exists, and the same is due to aggregation of capital in improper hands, and against this working people ought to be protected by unions, etc. Third, that certain people consider it to their interest to tyrannize over working men. Fourth, that there ought to be a safeguard against all the above, and that the writer knows—no; the SCIENTIFIC AMERICAN ought to discover—what it is.

Our correspondent writes intelligently, and his letter shows him to be an educated man. Hence there is the less excuse for his being a representative of a class of thinkers among our working men, of whom we trust and believe there are few. He labors under the notion that working men, because they are working men, ought to have some special privilege—ought to be exempted from the consequences of conditions which affect every other soul in the community—or, in brief, ought to be permitted to throw their share of the burden on other people's shoulders and go scot free. This is a confession of weakness and a virtual appeal for charity, which every manly, strong-armed worker in this country, we believe, repudiates from the bottom of his heart. The men know, or ought to know, that their fortune depends on their own efforts; that so long as work exists they have the same right to decide whether they will remain in any one place, or pursue any particular branch of trade, or hire themselves to any particular employer, as any employer has to make a selection from their ranks. If a man chooses to stay a lifetime in one place, he does it for his own benefit; and there is no law, moral or otherwise, to compel an employer to pay him more for doing so. Most employers find it to their interest to retain old and tried employees, and often to offer inducements to gain that end. But after all it is a question of pure interest; and sentimentality—always out of place in business dealings among mankind—has nothing to do with it. If work does not exist then, whatever be the cause, the working men have only to use their eyes and look about them to discover that it exists none the more for other people, who are not directly regarded as belonging to the working classes. That if there is no work for them at the looms, there is none for the dry goods merchant in his office; and so on through every branch of industry or commerce. Unless, therefore, work can be created for all the community, and every one helped and protected: a state of affairs which the SCIENTIFIC AMERICAN, though never so willing, honestly confesses its inability just at present to bring about: we do not see how we can rationally undertake to make the discovery toward which we are urged.

Our correspondent adds that we argue on the side of capital and against labor. We recognize no such distinctions. We simply see some men employing, others employed, whose relations to each other and to the community are based on a few simple truths firmly grounded in justice and common sense. These truths, and these only, underlie the views we express.

NOTES OF PATENT OFFICE DECISIONS.

PATENTS.—Mr. Gray, an inventor, sent to the Patent Office a drawing and specification relating to an invention, and requested that they might be filed in the secret archives as a caveat. He represented himself to be, not the sole, but a joint inventor with another party of the invention represented in the papers.

The question was raised by the officer receiving these applications as to the propriety of putting on the record a caveat relating to a joint invention without the signature and oath of *both* inventors.

It will be remembered that caveat papers are simply preliminary papers filed in the Office for the purpose of securing notice in case of interfering applications while the cave ator is experimenting of maturing his invention. A caveat cannot be merged into a patent, and is no foundation in itself for any such issue. As the only object in filing a caveat is to obtain notice of interfering applications, the right of one joint inventor to this notice should not be subject to the control of his co-inventors. The Commissioner of Patents therefore decides that it is sufficient if a caveat is signed by only one of two or more joint inventors.

TRADE-MARKS.—In the case of Cornwall and Brothers, the trade-mark sought to be registered consisted of the word "Dublin," to be printed on labels applied to boxes of soap.

It is a well recognized rule that the name of a district, town or city cannot be appropriated as the exclusive property of any one. In the case of Green (8 *Official Gazette* 729) the Commissioner of Patents indicated the practice of the Patent Office in regard to geographical names. If they are descriptive of a certain place or locality where the goods or ar ticles to which they are to be applied are produced, then they are objectionable on the same ground that all merely descriptive words are objectionable as trade-marks. The applicants, however, claimed that as they did not make their soap in Dublin, Ireland, but in this country, the term "Dublin" was not descriptive in any sense, but was an entirely fanciful and arbitrary symbol. There was no evidence that there was any soap on the market known as "Dublin" soap. If such fact had been established by the evidence, it would have been the duty of the Patent Office to refuse registration on the ground that the adoption of the same title by the applicants would be deceptive and a fraud upon the public. Thus, for instance "Dublin brown stout" has a well known reputation, and the fact of its notorious use would be conclusive evidence of fraud as against a citizen of another place, who asserted the right to use the term in designating his product.

It further appeared, in this case, that there was an extensive use, throughout the country, of labels applied to soap manufactured by firms in this country, bearing the titles "Irish," "Limerick," "Scotch," etc., and that the public generally had become aware of their purely fanciful signification. It did not seem likely, therefore, that they would be deceived by the addition to this medley of the word "Dublin." Neither would the public, probably, be convinced that a sudden importation from Dublin had taken place. The acting commissioner decided that the word "Dublin," as above used, might be registered as a trademark, as such term thus used was not intended as, and had not the effect of, a geographical word, and that in view of the peculiar circumstances of the case it was also not deceptive.

DECISIONS OF THE COURTS.—In the case of Perrigo *vs.* Spaulding, a motion was made for an injunction against the defendant on a bill in equity under letters patent granted to one Birdsall—the assignor of complainants—to enjoin the *use* of an infringing machine. Prior to this Birdsall had sued the makers and vendors of the defendant's machine, and recovered from them their gains and profits for all machines made and sold by them, among which was the defendant's machine. The case was heard before Johnson, Circuit Judge, who, upon the above facts, denied the injunction. The following rules are laid down by the court:

When a patentee gets his remuneration by patent or license fee, a recovery of such patent or license fee from an infringer and its payment authorizes the infringer to use the particular articles for which such recovery has been had.

When a patentee chooses to use his invention himself, and finds his remuneration in the sale of the products of its use, a recovery against an infringer, for profits and damages, will be limited to the profits and damages up to the time of the recovery. Such a recovery will not carry with it any right to the further use by the infringer of the invention.

Where the patentee sells his patented instrument or machine, for use by others, finding his remuneration in the profit of the sale of the manufactured machine or instrument, a recovery of profits and damages from the manufacturer of an infringing machine is a full compensation of his injury, and places him in the same position as if he had made and sold the machine himself, and confers on the machine the right to be used while it lasts.

When a full recovery and satisfaction from one party has been had, the patentee has obtained all that the law gives him, and the particular article or machine becomes, in effect, licensed by the patentee, and may be used so long as it lasts, free from any further claim by the patentee.

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THE MANUFACTURE OF PLUMBAGO CRUCIBLES.

"Dutch pots" was the commercial name for plumbago crucibles, up to forty-five years ago. The Kaufmans, of Obernzell in Bavaria, were the only manufacturers in the world, and their limited production found but restricted use, for melting pots were more commonly made of clay and sand. At the present time American plumbago crucibles, made of American black lead from the mines near Ticonderoga, N. Y., of better quality and cheaper in price than the Bavarian pots, are sold in Obernzell itself. More are sent to Germany than to any other country, and they have driven "Dutch pots" out of market after market; until, now to be found in every metal working district, they have taken their place in that long list of industrial exports in the constant growth of which may be discerned the promise and potentiality of the United States becoming the greatest exporting nation on the globe.

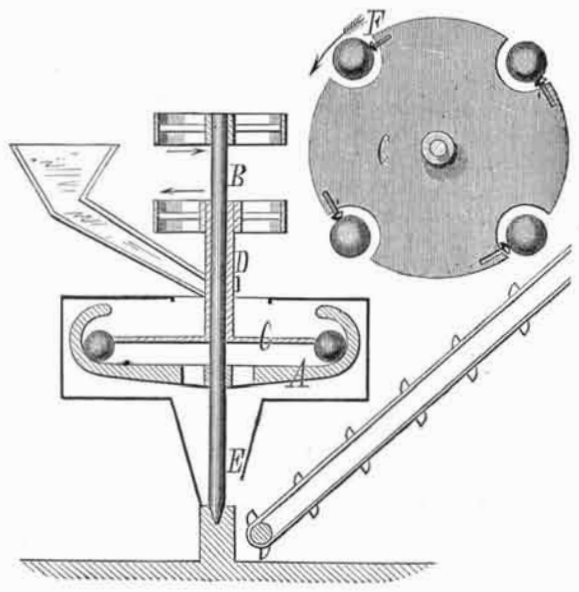
Graphite, plumbago, or black lead—the names are synonymous—is extracted from the mine either in the foliated or the granular form. For crucible manufacture the first mentioned variety is used, and of the quality known as "prime lump;" and in the works of the Joseph Dixon Crucible Company in Jersey city (to the President of which corporation, Hon. Orestes Cleveland, we are indebted for the facts here presented) the first process which it undergoes is that of grinding in so-called "cannon ball" mills. A section and plan of one of these machines is given in the engraving. A is a heavy iron saucer-shaped receptacle, having an aperture in the center, across which extend arms, connecting it to the central shaft, B. This shaft is rotated by the pulley shown in the direction of the arrow. Above the saucer is a disk, C, see plan view, in which are four recesses. In these recesses and resting on the saucer below are four thirty-two pound cannon balls; and attached to the middle of the disk is a sleeve, D, enclosing shaft, B, and carrying a pulley, by which it is rotated in a direction relatively opposite to that of shaft, B. A casing surrounds the mill, and through this casing at its center the graphite enters, emerging below through the funnel, E, whence it is taken away by an elevator. When the graphite enters, the centrifugal force generated by the swiftly rotating parts throws it outward so that it may be at once acted upon by the balls. Wear by the latter on the disk is prevented by steel pins, F. It will be obvious that under this condition the heavier particles of the material will approach nearest the circumference while the finer ones will arrange themselves in the order of their weights toward the center. Consequently the finest ground graphite will always be that which is escaping from the mill, while the grinding parts constantly act on the coarser portion. The substance really therefore is ground but once, and there is no grinding and regrinding of already sufficiently pulverized material. In this way, we are informed, the grinding operation is greatly facilitated and at the same time the graphite is reduced to a degree of fineness unattainable in the ordinary forms of mill.

With the plumbago thus prepared is mingled a small proportion of kaolin or china clay, varying according to the use for which the crucible to be made is intended. To every 10 parts of graphite is also added 7 parts of a gray clay which is imported from Klingenberg in Bavaria, besides a little ground charcoal, the latter to secure porosity. These ingredients are mixed dry; water is afterwards added and the compound passes to a huge cast iron cylinder capable of holding about 3 tons. Here thorough stirring is done by means of arms arranged radially on a central vertical rotating shaft. Each arm, besides having four vertical beveled blades, is made flat above and beveled below, so that the mass undergoes a kneading which secures its rapid and homogeneous mixing.

The material emerges of the consistence of thick mud, and is at once moulded into crucibles. This is done either by hand or by machinery, special forms being made in the former way. The desired quantity being weighed, the moulder shapes it into an egg form and places it on the rotating potter's lathe before him. Then, with his bare hands, he presses it first into shape resembling an apothecary's mortar, then his fist goes into the middle to form the cavity, and then succeeds an indescribable series of pressures and measurings, the upshot of which is the completely formed crucible standing on the wheel. A wire run under it loosens it from its support, it is lifted off upon a board, and three squeezes between the hands convert it into a three-cornered vessel. It is then placed aside for twenty-four hours to become dry.

The machine process is exactly the same as that in common use by potters for moulding plates, tea cups, etc. A plaster mould is prepared, which is placed on the rotating wheel. Into this the ball of graphite mud is placed; and as the mould rotates, a former is brought down into it from above, which carries the material out against the sides and forms the inner cavity, according to gauges previously adjusted. The mould is then taken from the lathe; and after the crucible has become dry enough, the latter is turned out, placed upside down on the wheel, and its exterior smoothed by hand.

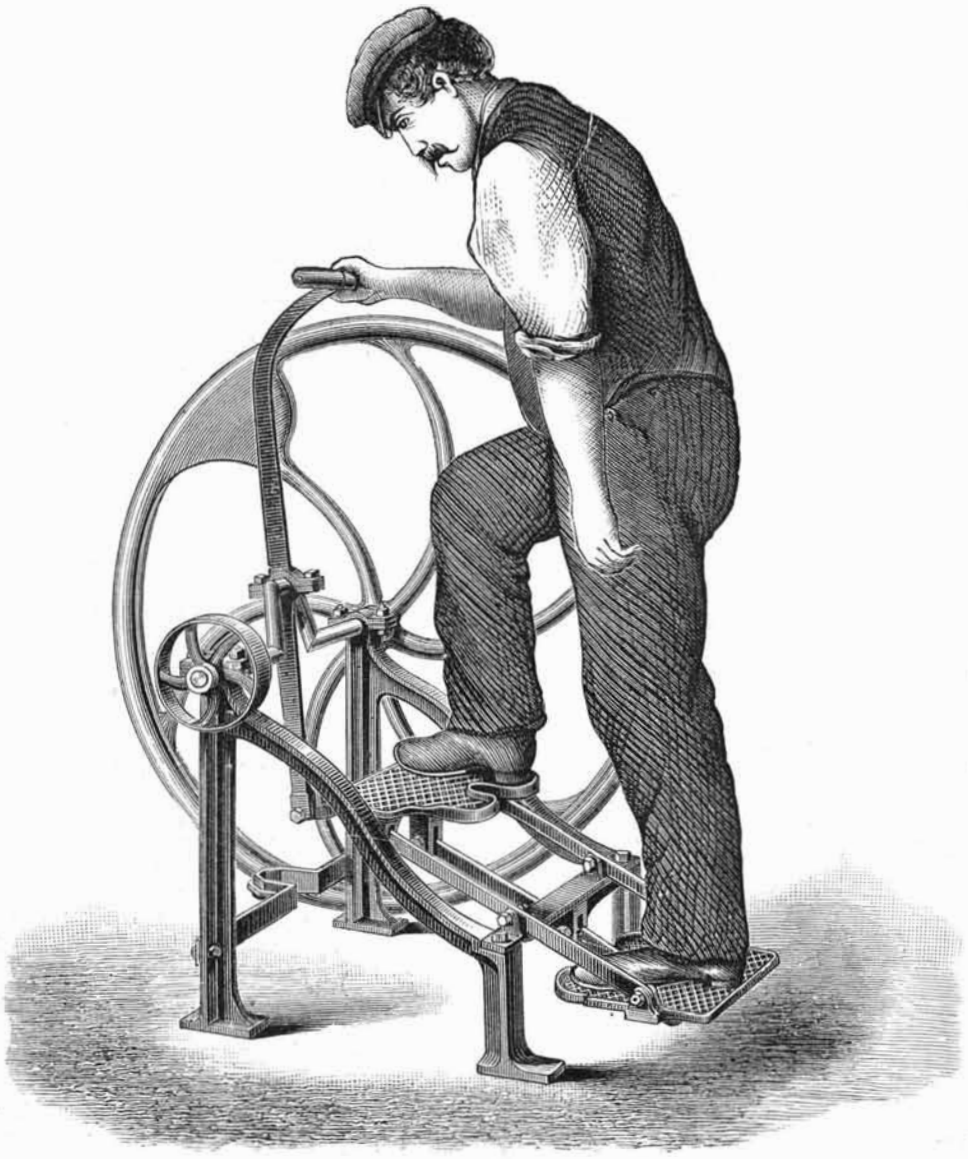
The baking process, which next ensues, does not differ from that followed by potters. Each crucible is enclosed in



large fire clay vessels, known as "saggers;" and a number of these are heaped up in the kiln. At the works visited by us, there were two kilns, one capable of holding 60,000, the other 80,000 "numbers." A "number" in crucible making means two pounds of material. When the baking is finished the crucibles emerge hard, and varying in color from grayish-white to blue-gray. The difference in hue is no criterion of quality, and is simply due to cracks or other imperfections in the saggers.

In point of size, plumbago crucibles hold from 2 ounces up to 600 pounds. Their average lifetime in brass making is from 35 to 45 heats. Clay crucibles can be used but once. For melting steel they will run from four to six times, and longer if coated with a mixture of fire clay, plumbago, charcoal (or better, gas carbon), and silica (pure fine quartz sand). Care should be taken to remove slag from the surface after each melting. Old steel pots are freed from slag, ground up, and remanufactured into crucibles. The same "metal" used for crucible making is also formed into plugs or valves in the ladles used for conveying molten steel, made by the Bessemer process, to the moulds. Plumbago crucibles may be generally employed, except in cases where a flux is used, as the flux would eat the clay from the lead. In using them, they should be kept in a dry place, the least dampness being fatal. It is well, for the first time of running, to put the crucible in the furnace at the time of lighting the fire, so that it heats up gradually with its surroundings. The pot should be placed in the fire and not on it, and the fire should surround it to the very top.

We shall shortly present another illustrated article derived from the same source, and describing the various processes of lead pencil making and other industrial utilizations of plumbago.



THE BAROMOTOR.

Tests for Copper Solutions.

The solutions of copper possess a blue or green color, which they retain, even when considerably diluted with water. With caustic potassa they give a light blue bulky precipitate, turning blackish brown or blackish brown or black on boiling the liquid. Ammonia and carbonate of ammonia produce a bluish white precipitate, soluble in excess of ammonia, yielding a rich deep blue solution. The carbonates of potassa give a similar precipitate to the last, but insoluble in excess of the precipitate. Ferrocyanide of potassium gives a reddish brown precipitate. Sulphuretted hydrogen and hydrosulphuret of ammonia give a blackish brown or a black one. A polished rod of iron, on immersion in an acidulated solution, quickly becomes coated with me tallic copper.

THE BAROMOTOR.

The annexed engraving from the *Revue Industrielle* represents a new man power or treadmill. The pedals are pivoted to three levers which are journaled to the lower crosspiece of the frame. The rear arms of the pedal levers are shorter than the front arms, so that the operator is saved the fatigue of lifting the leg which is in rear to any excessive height. The mode of connection of the levers to the crank is plainly shown. To the latter is also attached a hand lever, whereby the operator steadies himself and also keeps the shaft over the centers. The inventor, M. Gaston Bozerian, states that a speed of from 28 to 30 revolutions of the fly wheel per minute can be maintained. developing about 133 foot pounds. He has given to the apparatus the above name.

The Balance of Trade.

There has been much muddying of the waters concerning the exact import of the phrase, "the balance of trade." We think that the whole difficulty in the proper understanding of this phrase grows out of the presumed necessity of applying a cast iron rule of interpretations to every country that has commercial intercourse with the rest of the world. There is, however, a vast difference between debtor nations and creditor nations.

The United States is a debtor nation. It owes large sums to other countries for money borrowed for various national, State, municipal, corporation and other purposes. If, now, in addition to owing the debts abroad, it should annually export less than it imports, undoubtedly it would be increasing those debts, and if this course were continued long enough the country would be bankrupted. It is because we have of late been exporting much more merchandise than we have imported, and thus decreased our debts abroad and our gold shipments, that we say the balance of trade is in our favor, and so it is, for we are paying our debts. Great Britain is a creditor nation. Other nations owe it large sums of money for all sorts of loans and investments. Much of this indebtedness was created generations ago, and some of it is of recent creation. In all cases the loans and investments were made from British savings, accumulated by means of her wonderful industrial policy. If, then, Great Britain should in any one year or in any series of years export less of her manufactured goods than she imports of the raw or manufactured products of other countries, t does not follow, because the balance of trade is nominally against her, that she is thereby growing poorer. Not at all. In the very excess of her imports over her exports may lie her prosperity, for this excess may represent the profits she is receiving upon her investments in foreign countries. Of course the more of her manufactured goods Great Britain can export, the more her commercial prosperity is enhanced; but if her imports also increase the meaning is that her profits are increasing. The above is not the only explanation of the balance of trade problem that might be adduced, but it is the principal one, and for all practical purposes it is sufficient.—*Bulletin of I. & S. Assoc.*

WHEN pure, gallic acid forms small, feathery, and nearly colorless crystals, which have a beautiful silky luster.

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Mysterious Fires in Petroleum Refineries.

A serious fire of a mysterious nature, occurred at the extensive works of the Standard Oil Company, at Hunter's Point, Long Island, at 10 A.M., on September 1. About fifteen hundred barrels of petroleum had just been pumped from the stills into a large new agitator, made of heavy rivetted wrought iron sheets, lined with lead. The object of this vessel is to allow mechanical agitation of the oil, after sulphuric acid has been added, to further complete purification; and the leaden lining was to protect the iron from the acid. It is stated that the workmen turned into this vessel "a stream of cold water or steam," and immediately the oil inflamed, and could not be extinguished by all the efforts of thirteen fire engines, which soon arrived. By throwing water, however, on the outside of the tank, the rivetted seems were prevented from opening, and in the meantime about 200 barrels of oil were drawn off to another tank. This saving was soon stopped by the choking of the pipe with the melted lead. The loss in oil was about $10,000 to $15,000, and the cost of the agitator tank $20,000.

It appears from the reports of the workmen in the various petroleum refineries that fires often break out in them in spite of all precautions, and without any visible cause. Persons familiar with the refining of petroleum also say that, if cold water is poured on warm oil for the purpose of cooling it, the oil will sometimes suddenly ignite. It is unfortunate that, in this case, it is not certain whether it was water or steam which was applied, but if the fire arose from chemical action, the composition of the two substances was the same, only the high temperature and vastly expanded condition of the oxygen in the steam might have caused it to unite rapidly with the carbon of any of the more volatile portions of the partially refined oil, which might, by imperfect process, have been allowed to enter the agitator. Petroleum is not spontaneously ignitable in air under ordinary atmospheric conditions, but it is well known that spontaneous combustion, though generally slow in inception, often occurs rapidly from the quick absorption of oxygen from water or damp air by highly carbonized substances, of which special instances may be mentioned in lampblack works, and places where charcoal finely pulverized is used.

In the former description of industry, care must even be taken, especially in cool weather, to wipe the inside of window glass, lest a few drops of condensed dampness should furnish oxygen sufficient to start a fire, from the avidity of combination which the floating, highly comminuted material has for oxygen. These and similar facts, considered in connection with the chemical constituents of petroleum, may yield perhaps a clue towards the discovery of the mysterious fires. Of course, there is another cause which may exist in the fumes of naphtha (which often travel long distances unsuspected), floating from the stills to the agitators, and there, by some means, becoming ignited.

Petroleum is a compound of several hydrocarbons, the average of the two elements being, say carbon 85 per cent, hydrogen 15 per cent. Water is a protoxide of hydrogen—that is, composed of two volumes of hydrogen to one of oxygen; but, by weight, there are in water eight parts of oxygen to one of hydrogen—the percentage being exactly, according to MM. Berzelius and Dulong, 88·9 per cent of oxygen and 11·1 of hydrogen. The latter gas is sixteen times lighter than oxygen.—*American Exchange and Review.*

HOW TO SOFTEN RESIN.—Melt the resin, and while in a state of fusion add tar. The proper degree of hardness can be ascertained by dropping a small portion of the melted mass into water.

THE luster of morocco leather is restored by varnishing with white of egg.

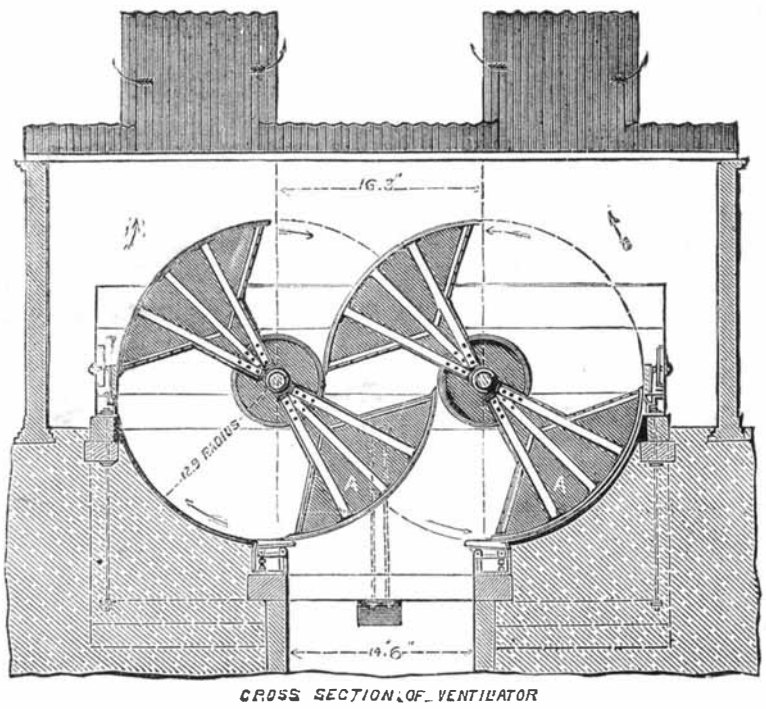
ROOTS' BLOWER FOR MINE VENTILATION.

The Roots' blower is a rotary air-compressing machine, as distinguished from a fan which throws the air off by centrifugal action. In principle it is analogous to a blowing cylinder, with the difference that the air is expelled constantly in one direction and in four distinct volumes at each revolution of the blower; but with a blowing cylinder the direction of the current of air is altered at each end of the stroke.

Blowers of a capacity of 100,000 cubic feet per minute had been constructed, and one of this capacity was employed for working the Beach Pneumatic Railway under Broadway, New York city. The leading feature of Roots' blower consists of two duplicate rotary pistons, fixed upon separate shafts and working in a casing, which is provided with inlet and outlet openings either at the top and bottom, or at the sides, according to the position in which the machine is arranged. The rotary pistons in revolving are maintained in their proper relative positions by gearing on the shafts, and they revolve closely together, but not in actual contact with each other or with the casing.

As a ventilator for mines the blower is shown in the accompanying cuts, for which, together with description, we are indebted to *The Engineer*. This ventilator has been fixed at the Chilton Colliery, near Ferryhill, belonging to the South Durham Coal Company, England, and was started at the beginning of this year, it having been in constant work up to the present time. It consists of the two rotary pistons, A A, Fig. 1, which are each 25 feet diameter and 13 feet wide, and are built up upon steel shafts. Upon each of the shafts are keyed five cast iron disk plates, C C, Fig. 3, having flanges at their circumference which are all turned to exactly the same diameter. In each disk plate there are three wrought iron bars, D, Fig. 2, fixed on each side of the centre, and reaching to the outside of the rotary piston; planed recesses are provided in the disk plates to receive the bars which are

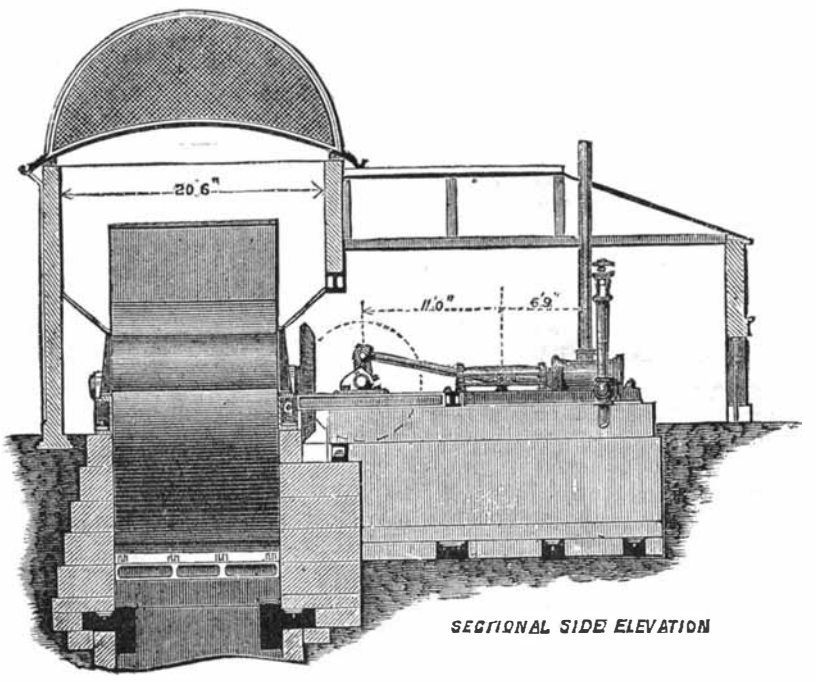
Fig. 1.



CROSS SECTION OF VENTILATOR

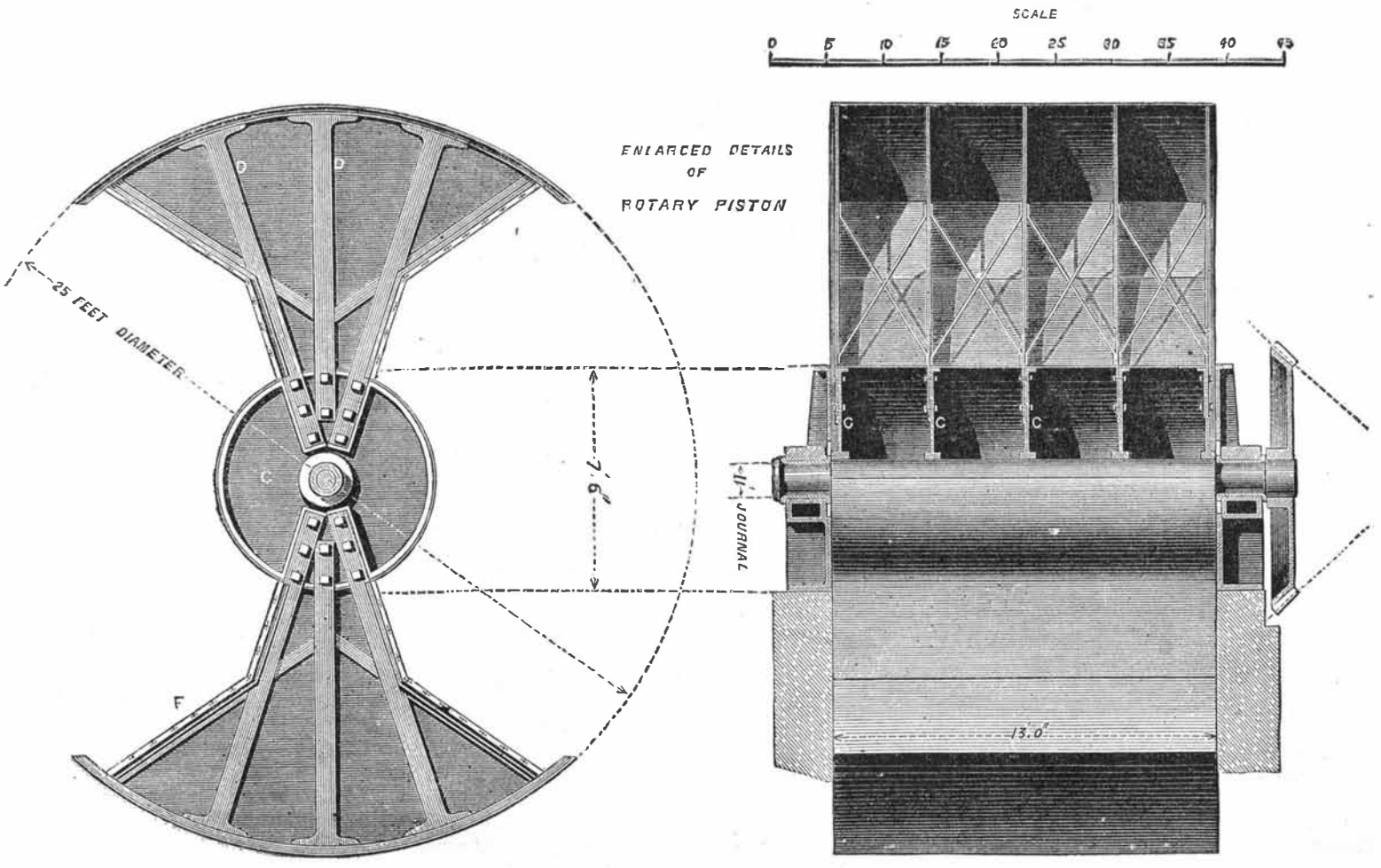
Fig. 2.

Fig. 4.



SECTIONAL SIDE ELEVATION

Fig. 3.



ROOT'S BLOWER FOR MINE VENTILATION.

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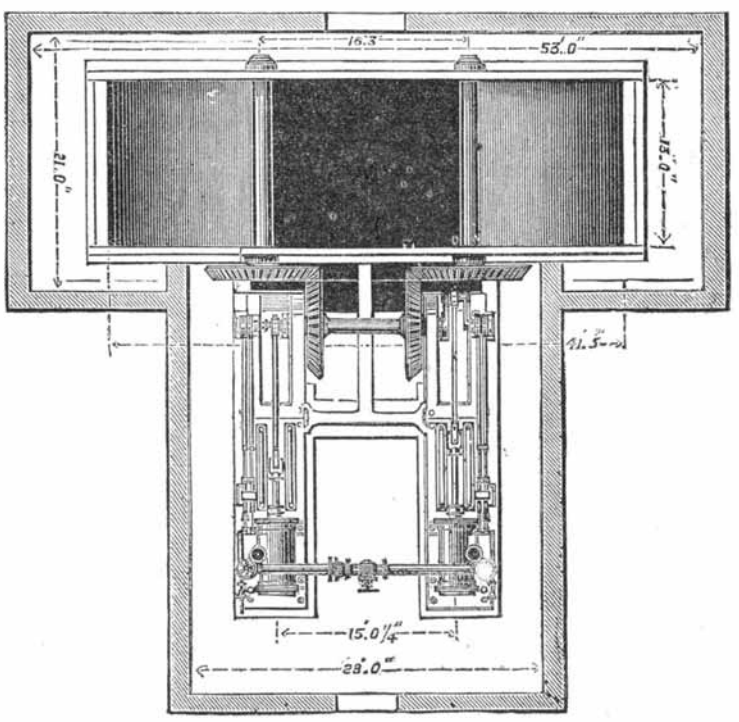
also secured to the disk plates by bolts turned to fit. The outer ends of the bars are widened, and marked off and slotted to the radius of the outer circle. Angle irons bent to the radius of the outer circle are riveted to the extremities of the bars, and are covered with ¼ inch sheet iron plate; the center circles are also covered with ⅛ inch sheet iron plates on the turned flanges of the disk plates, C C. The sides, F F, of the pistons are covered with wood, and the ends with sheet iron. These rotary pistons revolve in bearings fixed upon deep cast iron girders, which form the framework of the ventilator pit, and are connected at each end of the ventilator by cross girders. The girders and the cast iron side plates above them are planed on their inside surfaces, and the stonework of the ventilator pit is dressed off level with the planed girders. The engines to drive the ventilator are a pair of 28 inches cylinders, Figs. 4 and 5, with 4 feet stroke, and provided with adjustable cut-off valves. They are placed at right angles to the ventilator, and are connected to it with bevel wheels 9 feet 2¾ inches diameter, two bevel wheels being fixed upon the crank shaft, each gearing into a bevel wheel keyed upon the end of the ventilator shafts. The engine beds are carried along and fixed upon a stay girder, securely keyed and bolted to the main girder, G. The main girders are fixed 13 feet ¼ inch apart, therefore the clearance between the rotary pistons of 13 feet and the sides of the ventilator pit is only ⅛ inch on each side. At each end of the ventilator pit, and at the bottom on each side of the inlet from the upcast shaft, adjustable packing blocks of timber are fixed upon hinged iron frames, and can be adjusted with screws and nuts; these blocks are set up quite close to the periphery of the rotary pistons within ⅛ inch. The clearance between the periphery of one of the retary pistons and the center circle of the other is also the same, and thus in any part of the ventilator the clearance for loss by returning of the air is not more than ⅛ inch. Between the packing blocks, I I, the ventilator pit is dug out and lined with cement; but there is considerable space between the layer of cement and the outside circle of the rotary pistons, and dependence is placed only upon the packing blocks to maintain the tightness of the pistons with the ends of the ventilator pit.

Chilton Colliery is a new pit raising 800 tons of coal per day, and the present requirements in the way of ventilation are amply met by running the ventilator at fifteen revolutions per minute, giving a calculated displacement of 87,000 cubic feet of air per minute. At this speed better results would be obtained by using only one cylinder, and letting the other engine stand, as will be done in the case of repairs; the two engines are only intended to be used when the ventilator is working up to its full maximum quantity of 200,000 cubic feet of air per minute. The arrangement of the engine house and ventilator building is shown in Fig. 5; the discharged air escapes through perforated openings in the roof, and owing to the very large area of outlet from the ventilator—the top of the ventilator casing being left entirely open—the air that is being exhausted from the pit must necessarily be delivered into the atmosphere at a lower velocity than is usual with other ventilating machines.

These blowers are manufactured by P. H. & F. M. Roots, Connersville, Indiana. S. S. Townsend, general agent. Cooke & Beggs, selling agents, 6 Cortlandt street, New York city.

PLAN

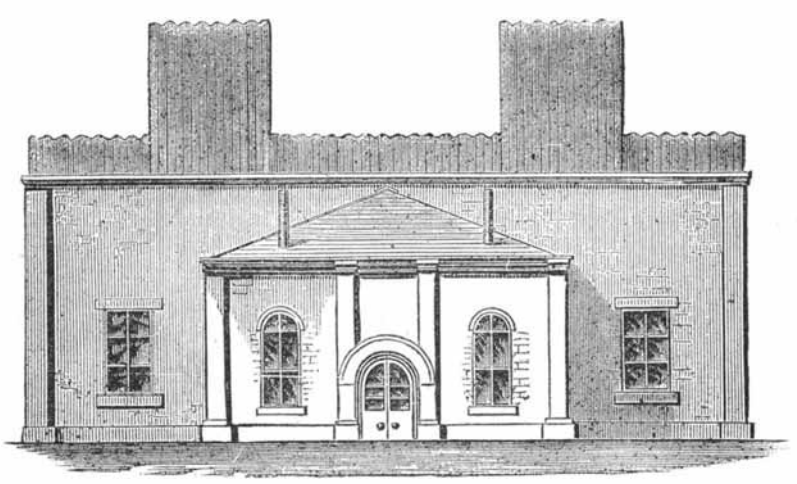


ROOTS' BLOWER FOR MINE VENTILATION.—Fig. 5.

Curious Proclivities of Insects.

This strange distinction between beautiful and hideous plants was curiously illustrated by Sir John Lubbock, during a recent address at Brighton. We find an abstract in the London *Telegraph*. Bees, it seems, are fond of pleasant odors and bright colors, and affect plants in which we ourselves take pleasure. If a bee is watched in its progress through a garden, it will be found hovering over mignonette, the roses, the tall white lilies, the lavender, and all other flowers of bright color or sweet scent. Flies, on the other hand, prefer livid yellow, dingy red, and very unpleasant smelling plants. The bee is a fastidious insect of sensitive tastes. The fly is a species of insectoid vulture, with a natural proclivity for carrion, or anything resembling it. Any one who takes a couple of plates and places them on the lawn, a yard apart, putting on one a specimen of the abominable underground fungus, the "stinkhorn," and on the other a glass of moss roses, will see that in a few minutes the foul-odored fungus will be covered with flies, while the bees will flock to the roses. It is to this love of bees for beautiful colors and pleasant smells that we owe our choicest flowers. Flowers, as Sir John Lubbock pointed out at some length, and as is now generally known, are principally fertilized by insects. The bee flying from flower to flower carries the golden grain from the anthers of one to deposit it on the pistil of the next. Crossing in flowers tends, as in all other living things, to improve the size, strength, and beauty of the species. Flowers which are "cross-fertilized" by insects reach the highest state of excellence. Self-fertilization, according to Sir John Lubbock, tends to dwarf the specimens. Indeed, in the case of a convolvulus, it has been shown by actual experiment that when self-fertilized it only grows to a height of five feet, while when cross-fertilized it will reach seven feet and a half. So far, bees and flies perform the same work, the difference between them being that the bees, as we have said, love beautiful colors and fragrant odors. More than this, each bee appears to have its proclivities, or at any rate, its habits. Sir John Lubbock himself taught a bee to go to a certain place for honey on blue paper for some days consecutively. After his winged pupil had paid several visits to the blue paper, some honey was placed on a piece of orange-colored substance. The little insect was at first in doubt, but after hesitation of a few seconds, it rejected the jaundice-lined repast, and dashed at the blue paper. From these tastes and fancies on the part of bees, it has in the course of long years come about that the plants which bloom by day have bright colors and a sweet smell. Similarly night plants, although as a rule colorless, are yet often powerfully scented, the reason being that they are fertilized by nocturnal moths, which have a sense of odor fully as delicate as that of bees, and, like bees, are fond of honey.

Sir John Lubbock's researches lead him to the conclusion that these causes have been through countless ages acting and reacting upon one another. The most lovely flowers have attracted bees, and consequently the finest blossoms of the year have been cross-fertilized each by the other. Thus, for century after century, flowers have been growing more and more beautiful; while, strangely enough, a similar process has been going on in the case of those plants which are affected by flies, and their unwholesome and disagreeable qualities have become intensified. When we consider the law hereby indicated we gather from it a practical rule, of of which the skilled gardener ought to avail himself. Many centuries have passed since the blind bard of Hellas assured us that "such as is the race of blossoms, such is that of men." Blossoms there are which the wind tosses to the ground, but others, again, the wide wood bears when the season of spring comes on. The practical distinction between flowers and ourselves is that, while the years of man are threescore and ten, the blossom, as a rule, has a life of a year only, and that in twelve years, by artificial selection, you can effect for a plant that which natural selection in the case of man may possibly accomplish in a score of centuries. In our gardens Sir John Lubbock's friends the bees do their work admirably. But in hothouses, where bees do not penetrate, everything is due to the skill and care of the gardener, who must exercise a judicious choice on his own account. Nothing is more remarkable than the results which could be effected in floriculture by those who have time and attention to bestow upon it. There is no better instance than that of the calceolaria. The ordinary calceolaria has a little yellow blossom, three of which would lie upon a shilling. By careful selection, plants can be produced of the most exquisite and variegated hues, and of which a single blossom would entirely cover and hide from the view a two shilling piece. Here we have done for us in the course of a few generations what nature, by the aid of her workers, the bees, might possibly have accomplished in the course of ages. Indeed, the possibilities of floriculture are so infinite as to make it matter of regret that it should, like cookery and costume, have been allowed, for want of that dignity which attaches itself to a recognized science, to remain little more than a trade. If, for instance, the same care were taken with the cultivation of the water-lily that is bestowed on the rose, what might not be the result? Why should we not grow water-lilies the size of soup plates, with every leaf as mathematically perfect in dimensions and outline as the leaves of a prize dahlia? Why should not magnolias blossom in our hot houses four, five, or even ten times larger than the present exquisite white flower with its tender flavor of citron? The actual wants of life come before its pleasures, in spite of the sneer of the Epicurean, who said that if he only had the superfluities of this world, he could do very well without its necessaries. Flowers are as much a superfluity as are pictures, or statuary, or Brussels lace, or mediæval furniture, or Japanese china. Beyond all these things, however, they have about them a bright, fresh, and wholesome influence of their own. If half the money that is now wasted on mere freaks of fashion were spent in systematic floriculture, the earth at any rate would be made more beautiful, and a reasonable and healthy occupation would be found for many idle hands.



FRONT ELEVATION OF ENGINE & VENTILATOR HOUSE

ROOTS' BLOWER FOR MINE VENTILATION.—Fig. 6.

New Tests for Milk.

Dr. Heusner, of Barmen, has recently devised a simple apparatus called a *lactoscope*, which is based on the opacity of pure milk. It consists of two round plates of glass about the size of a watch crystal, placed parallel and held about ⅛ inch apart by a metal strip, which passes between them, dividing the space between them into two sections. In the lower section is placed and secured some pure milk, or, better, some permanent white fluid of precisely the same opacity as pure milk. On one of the glass plates are some fine black lines. The upper section is filled with the milk to be tested, and secured by an elastic band. On holding the apparatus between the eye and the light, the black lines being on the side opposite the eye, the black lines will be seen more distinctly through the less opaque medium. If the milk to be tested is less opaque than the normal liquid, as shown by the lines being more distinctly visible through it, the milk has probably been watered or skimmed. Alone this little apparatus, which sells in Hamburg for $1.87, is of little use, but can prove useful in connection with the lactometer, both to be followed, in doubtful cases, by a chemical analysis.

In regard to the chemical analysis of milk, which is the only reliable test of milk, Professor Lehmann, of Munich, proposes the following modification to save time: A weighed quantity, say 9 or 10 grammes of milk, is diluted with an equal weight of water, and poured out in a thin layer upon a porous plate of burnt clay, very dense and fine-grained. The water of the milk, as well as the milk sugar, albumen, and a portion of the salts dissolved in it, are absorbed by the clay plate, while the total amount of fats and casein in the milk remain on the plate in the form of a thin skin or film. This film is easily removed with a horn spatula, and then dried and weighed. If it is desired to determine the fats alone, this film may be extracted with ether, and thus the two most important constituents of milk very quickly determined. In many cases it is sufficient to know the total weight of the principal solid constituents of the milk, hence also the amount of water, for which scarcely two hours are required. This method also possesses the advantage that a great number of samples can be tested at once without much trouble. It also does away with the use of numerous costly platinum dishes and troublesome water baths, which are always getting dry if not carefully watched. The operation is so simple that it can be used by any person who possesses an accurate balance and set of weights.

Relative Strength of Wood and Iron.

Herr Hirn has been conducting a series of experiments in Germany on the comparative strength of wood and cast iron in their different applications, and finds that in a great number of cases the former has the advantage. Professor Hirn finds the strength of wood to be in direct ratio to its *density*, and this strength is increased by immersing the pieces of wood in linseed oil, heated from 185° to 212° Fah., and letting the wood thus immersed remain for two or three days, or until partially saturated.

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Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The trade circular recently issued from the State Department to our diplomatic and consular officers has had considerable effect in causing those officers to make renewed efforts for the enlargement of our commerce in their several districts. The consul at Liverpool writes to the Department that he thinks that, besides the trade in American beef, a large trade could be done in American poultry, by exporting it to England either alive or dead. He gives the prices of turkeys, at wholesale, at fifteen cents per pound, and chickens as sixteen cents. He states that the American poultry is far superior to the English, and would therefore sell readily.

The consul at Amsterdam sends an interesting report on the leather manufacture of his district, in which he states that, instead of being exporters to America, as formerly, one of the largest of the leather houses now imports American goods into Holland. He also states that not content with importing leather, the same house had also begun to import New England shoes, for the European manufacturers cannot compete with the New Englanders either in price or quality, and that, besides sending large orders for shoes, the junior partner of the house referred to was about leaving for the United States to perfect and enlarge their business relations with American manufacturers.

In response to the same circular, an interesting report has been received from the United States consul at Frankfort-on-the-Main, on the prospects for an extension of American trade in eastern, central, and southern Germany. He appears to be of opinion that the present time is peculiarly favorable for the introduction and sale of American productions in that part of Germany; that although the people generally are disinclined to accept innovations, yet this obstacle will readily yield to the great law of profit and pecuniary interest which governs commerce; and that the existing plethora of grain, the languishing state of skilled productions, and the low rates of duty prevailing, especially invite our producers and manufacturers to find a profitable market there.

The consul at Havre reports, in reply to the same circular, that he has continually endeavored to induce shipments of our products, such as hides, pork, bacon, corn, etc., into his district. As an example of what a consul can do in forwarding the commerce of the country he represents, he states that, by inducing a few of the people of his district to feed Indian corn to the cattle in lieu of the small native grains, the trade in that article to Havre rose from a few samples in 1875 to 46,278 bushels in 1876, and for the first seven months of this year to over half a million of bushels; some of which was raised in the Mississippi valley, floated down that river to New Orleans, and shipped from thence direct to Havre. If this course was followed by the majority of our consuls, our trade with foreign countries would increase to such proportions as to soon cause us to bid farewell to "hard times," especially if their efforts were seconded by corresponding attempts of our manufacturers and merchants to follow out their suggestions.

The fact that Congress failed to make any provision looking to the participation of the United States in the French Exhibition has given rise to considerable apprehension lest those Americans who were desirous of exhibiting would be deprived of this pleasure and its anticipated profit; but it seems that a way has been opened by which applications for space at the Exhibition can be made and granted without waiting for the action of Congress, which may not be taken until after the opening of the regular session in December. It is stated that about one thousand applications have been sent to our legation in Paris, which the French Government have heretofore refused to consider because they had no official endorsement by our government, but the authorities have now consented to waive this formality, and these applications and all others received through the legation will be received and acted upon. This seems to be as effective, in opening the doors of the Exhibition to our inventors and manufacturers, as a formal acceptance by our government of the invitation of the French Government would be. There is plenty of time for such formal acceptance hereafter.

There has been in this city for the past week a large delegation of Indians, who came to hold one of their semi-occasional "pow-wows" with their "Great Father," to protest against being removed from their reservations, and to request aid towards the civilization of their race. Some of the Indians had never come in contact with civilization before, and consequently made their wants known in rather peculiar demands; but there appears to be no doubt as to the genuineness of the wishes of some of them for the benefits of civiiization. That some of the Indians are improving very fast in this direction is very evident from a recent report of the Board of Indian Commissioners, that is quite gratifying to the friends of the red men, for it shows that in 1868 the houses occupied by Indians numbered but 7,476, while in 1876 they numbered 54,717. There were then on the reservations but 111 schools; there are now 344. There were then 4,718 pupils attending school; there are now no less than 27,215 native scholars. Out of about 266,000 Indians, the Board estimates that over 100,000 wear citizens' dress. The Indians raised then 126,117 bushels of wheat and 467,363 bushels of corn; in 1876 they raised 463,054 bushels of wheat and 2,229,463 bushels of corn. They owned in 1868 but 2,683 sheep and 20,890 swine; in 1876 they owned 417,295 sheep and 214,076 hogs. All this is certainly very encouraging, and proves that under a proper policy, which shall hold out some inducements to them to follow peaceful pursuits, a large per cent of the red men may be saved to civilization.

On or about November 1, the Tybee (Georgia) beacon light will be exhibited from a new iron skeleton structure, erected forty feet southeast by south from the old beacon. The focal flame will be 28 feet above mean sea level, and the light will be visible ten nautical miles.

Washington, D. C. OCCASIONAL.

Titusville Gravel Pit Oil wells.

Mr. John F. Carll, assistant in charge of the oil districts, Pennsylvania, writes as follows in *Stowell's Petroleum Reporter*: In August, 1859, just 18 years ago, the quiet little hamlet of Titusville was electrified by the report that petroleum had been found in large quantities at a depth of 70 feet, in the Drake well. Since that time probably 30,000 oil wells have been sunk, and great improvement has been made in the art of drilling. An ordinary 1,500 foot well is put down to-day with more ease and dispatch than was this little 70 foot well in 1859. We are not even surprised to learn that the Watson well, within two miles of this first venture, has been carried down to the great depth of 3,553 feet, for we have become prepared for almost any achievement of the drill.

But now appear new claimants for our notice. The pick and shovel to-day step forward to take the place of the drill. A 15 foot gravel pit assumes to supersede the 1,500 foot drill hole. And, curiously enough, this happens on the same creek-flat, and within a mile of the old Drake well.

The gravel-well district of Titusville is the latest wonder of Oildom—at least it has been made such by the exaggerated reports and astonishing theories in relation to it, that have gained currency through the daily papers.

Let us see what are the geological facts concerning it, and what the relations it bears to the regular oil-producing rocks of the district.

Titusville is situated in a broad, irregularly outlined basin of erosion between hills more than 300 feet high, at the junction of Pine creek and Oil creek. The "flat," or old water plain, contains perhaps 100 acres, having its greatest length in a northwest and southeast direction. Oil Creek enters it at the northwest angle, and, sweeping around to the east and south, leaves it at its southwest angle. Pine Creek falling from the northeast and east, enters at the southeast angle, and joins Oil Creek near the outlet. Church Run from the north, Shaffer and McGee Runs from the south, and several other minor runs likewise empty into it. "Watson Flats," a locality renowned in the early history of petroleum developments, is included within these outlines.

The new oil pits are near the Pleasantville plank road, which passes along the northeasterly side of the basin before crossing Pine Creek. More than 100 oil wells have been sunk on these flats in the usual way since 1859 and by the length of drive pipe required to reach the bed rock, they conclusively demonstrate the fact that the channel of the old stream, once flowing between these hills, was a hundred feet or more below the present surface. Within a rod or two of some of these oil pits, 53 feet of pipe was driven through these superficial deposits, a little farther out towards the center of the basin 80 feet, and in the center about 100 feet. As the oil pits are only from 15 to 18 feet deep, it will be seen at a glance that the oil is not obtained from the stratified rocks, for the old wells referred to show that they lie much deeper, and have not been reached by the pick.

This basin, then, as it existed in pre-glacial times, must have been at least one hundred feet deeper than it is at present. It was occupied by a stream whose birth could scarcely have anteceded the close of the carboniferous period, and whose great age can only be surmised from the evidences it has left behind in the magnitude of work performed. At this point it has already cut down through the solid rocks to within fifty feet of the first oil sand. This would be equivalent (if the rocks originally lay here as they now lie at Pittsburgh), to a vertical excavation of 1,900 feet. It is quite probable that it flowed to the north (as did others of these northerly streams at that day), delivering its waters into the Lake Erie basin.

But now a great change occurs. The glacial epoch comes on. A thick ice-sheet covers all the northern country; slowly advancing and holding in its icy grasp fragments of rocks, gathered along its track, all the way from Northern Canada, it levels off the hill-tops, widens out the valleys, and plunges into the old river beds its burden of mixed transported débris. The northern outlets of drainage are all covered with ice and obstructed; and when long afterward, under a modification of climate, a recession of the glacier commences, pools and lakes of water accumulate in front of it; they fill up and overflow at the lowest depressions in the hills at the south. As these new outlets gradually deepen, the lake surfaces lower, the lake bottoms fill up with detritus brought in by the melting ice, and finally, when the ice disappears, we find the old river beds at the north filled up hundreds of feet with drift, the valleys almost obliterated, and a new direction given to all the drainage of this section of the state. This is but a brief and partial statement of the probable sequence of events during this epoch. It may serve to show, however, that the beds of gravel or land from which these pick and shovel wells obtain their oil could not have been deposited until near the close of the glacial period, for they lie very near the tops of the drifts. A careful examination of the sand or gravel shows that it is composed of a mixture of water now comminuted particles derived from the primary rocks, the Silurian limestones, and the local measures of the surrounding hills. It is a comparatively recent deposit, filling up an old deeply excavated channel in the sedimentary rocks, which channel had previously been the bed of a stream ages on ages before.

There is no marked difference between the deposit here and thousands of other drift deposits, scattered all across the country in this latitude. They were all laid down in the same era, and by similar agencies. The fact that this particular spot produces oil, while others, apparently just as favorably located, do not seem to indicate that the oil is not indigenous to the gravel bed itself. It is evidently derived from some other source, the gravel bed acting only as a reservoir for its reception and storage.

Many stories are afloat concerning the bursting of a pipe line near these pits, and the leakage of storage tanks form erly located in this neighborhood, and some affirm that the oil has leaked into the gravel bed from these sources. Others contend that it has ascended from the regular oil sands below through the old abandoned bore holes on the flat. But we think a much more probable explanation of the phenomenon can be found in the operations of natural agencies alone unaided by the accidents or interventions of men.

The gravel bed (the thickness of which is not at present known, as it has not been dug through) is capped by a sheet of tough, impervious blue clay, varying from four feet to twelve feet or more in thickness. This clay seems to cover the gravel bed like a hood, and the retention of oil in the gravel bed is no doubt due to the peculiar shape of the clay sheet.

Oil formerly issued with the waters of springs, and through the gravel of the creek bottom, in many places along the valley of Oil Creek. The Drake well, and some others of the early wells, struck oil before reaching the first oil sand. But it is now well understood that this oil came up from the first oil sand, which was in these places surcharged with oil. In the same manner, no doubt, the gravel beds have been supplied with oil. The first oil sand lies, as has been stated, only 50 feet below the bottom of the drift deposit. For ages the oil has been slowly escaping into the drift and working its way to the surface. In the locality of the gravel pits it was obstructed by an impervious sheet of clay lying immediately over a good deposit of coarse sand and gravel. In this almost hermetically sealed reservoir it collected, and here it remained until set free by the piercing of the clay hood above it.

How considerable the deposit of oil may be in this locality of course no one can tell. The agencies depositing the clay and gravel were wide spread and general in their action, but extremely variable in their local results. An examination of any railway cutting through a gravel bank will illustrate this. Small boulders, gravel, sand, and clay, will be found in many cases to be almost indiscriminately mixed, and no one class of material can be traced for any great distance. We should not, therefore, expect this peculiar structure of a clay-capped sand bed, which seems to be the requisite basis of a paying gravel well, to extend continuously over a very wide area. The whole question may be briefly resolved thus:

Given the clay sheet without the sand bed, the sand bed without the clay sheet, or the clay and sand in reversed positions, and no oil could be obtained. So also, given the clay and sand in good condition and proper position, but in a locality where there is no oil-producing sand beneath, and the same result would follow.

If, then, the success of a gravel well depends upon the rare and rather accidental conjunction of the several necessary conditions above mentioned, we need not apprehend any danger of an overflowing of the storage tanks, or an overstocking of the oil supply from the products of these drift deposit wells.

Boiler Explosions arising from Grease and Lime.

A late number of the *Annales des Ponts et Chaussées* states that a commission appointed to report on a boiler explosion at La Villette, Paris, attributed it to an insoluble deposit, composed chiefly of a calcareous soap, which formed near the opening close by the water feed pipe, and which was due to the nature of the waters used. Some of the water containing calcareous matter was furnished by the city; some came from condensers, bringing fatty particles, arising from the lubrication of the machines. The commissioners cite numerous accidents which have occurred within the last fifteen years, all of which are attributable to the same source. They therefore think it important that manufacturers should be warned of the danger, and if they are obliged to use such a mixture of waters, they should take all possible precautions, such as the purification of the calcareous waters by carbonate of soda; the filtration of the condensed waters by passing them through wool or felt; the skimming of the grease from the surface of condensing cisterns, and frequent drawing off of the surface of the waer in boilers.

TO MAKE MODELING CLAY.—Knead dry clay with glycerin instead of water, and a mass is obtained which continues moist and plastic for a length of time. This removes one of the greatest inconveniences that is experienced by the modeler.

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NEW SURFACE PLANING MACHINE.

In the experience of manufacturers it is often found necessary to abandon old methods of construction, and adopt new methods combining qualities of strength and utility not before recognized as being essential for the perfect operation of the machine or tool.

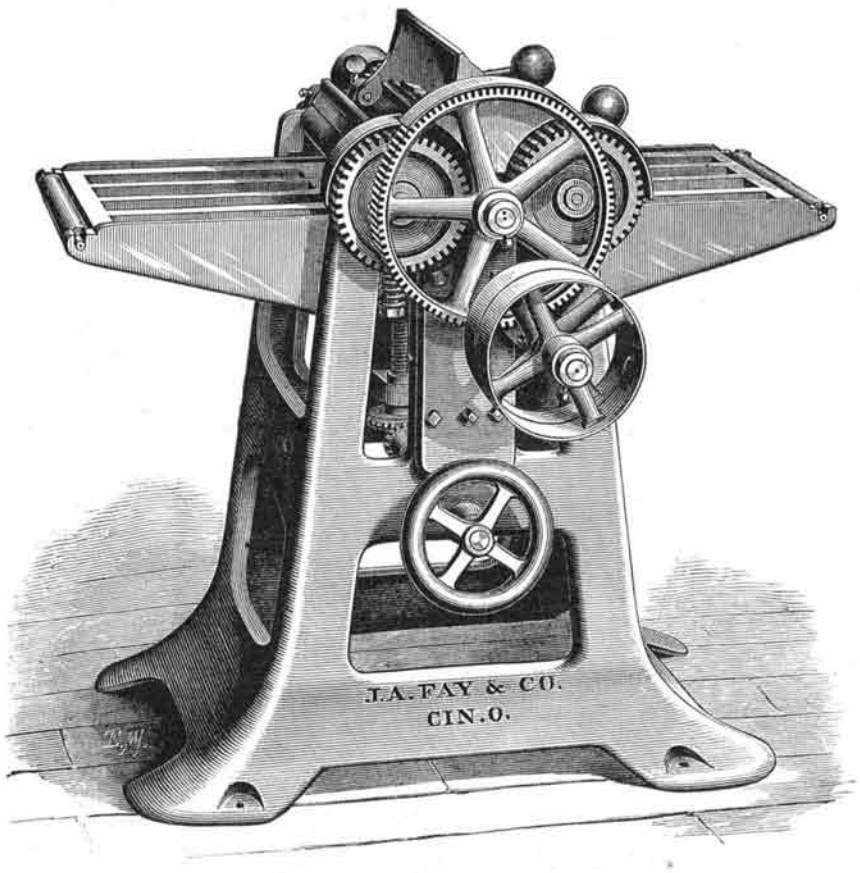
There are many apparently non-essential parts or adjustments of parts of machines, the indispensable utility of which are forced upon the experimenter, only through actual contact and by personally superintending the construction and operation, so that the practical difficulties may be observed and means provided to overcome them.

In this connection, we illustrate a surface planer for wood, designed and constructed by J. A. Fay & Co., wood-working tool manufacturers, Cincinnati, Ohio. It is quite novel in design and construction, and shows a considerable departure from examples heretofore exhibited.

The machine represented in the engraving is designed for surfacing only, and smooths but one side in its operation, the lumber passing between two pairs of rollers, under the pressure bars, and being gauged to an accurate thickness by passing over a smoothly finished table which is adjustable to the required thickness. The frame or column of the machine is a continuous casting, having the crosspieces, sides, and bearings for the cylinder all combined in one piece, forming an inflexible frame, being superior in this regard to the ordinary frame with independent crosspieces, the latter being much more liable to disarrangement. The cylinder is of wrought iron, arranged so that the knives (of which there are two) can be made to cut the roughest lumber without tearing the fiber of the wood or disturbing knots. The feeding rollers are strongly geared and readily started and stopped while the cylinder is revolving. The table or platen is cast in one piece; it is provided with friction rollers and adjusted by a hand wheel and screws connected by bevel gearing, and the thickness of the stuff being planed is indicated by a finger and graduated plate. The pressure bars are arranged closely to the periphery of the cutting edge of the cylinder, the bar before the cut swinging from a center as it rises to the thickness of the rough material, the bar, after the cut, being slightly flexible and adjustable to the wear of the different parts. The proportions of the bearings, to the cylinder, the gearing, feeding rollers, and other parts, are larger than is usual in this class of surfacing planers, thereby producing a substantial and reliable machine, and one evidently that will give entire satisfaction within range of its powers.

This machine is constructed in three sizes: 16 inches, 20 inches, and 24 inches in width, and will plane lumber to 5 inches in thickness, and is adapted for surfacing either hard or soft wood, and will be found of great utility in any wood-working establishment in the land.

We have already noted the fact that Messrs. J. A. Fay & Co.'s extensive exhibit at the Metropolitan Exhibition in New South Wales received both complimentary and meritorious premiums in competition with other machines. Any further information can be obtained by addressing the manufacturers as above.

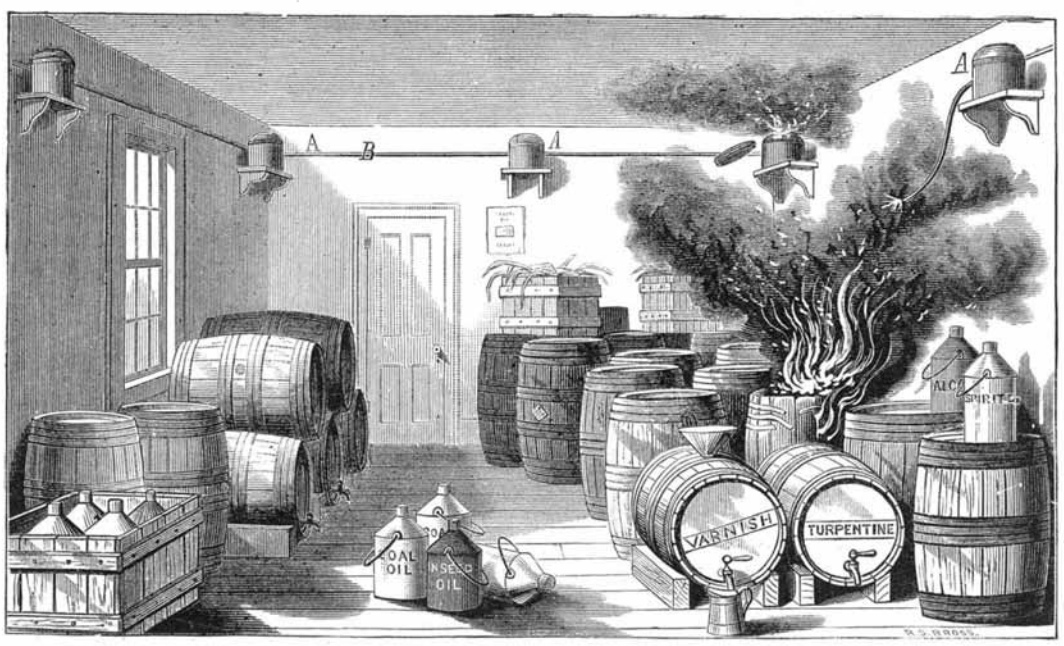


NEW SURFACE PLANING MACHINE.

IMPROVED AUTOMATIC FIRE EXTINGUISHER.

The accompanying engraving shows how a room can, it is claimed, be made secure against fire by a new automatic fire extinguisher, which consists of a dry chemical compound, which, when ignited absorbs the oxygen of the air and smothers the fire by evolving gases that are antagonistic to combustion. The invention is especially adapted in all places where the usual fire engines and other extinguishing devices are not immediately applicable. It obviates the necessity for water and the damage frequently incurred thereby to the goods. To make the compound self-acting, the boxes, A, containing the extinguishing compound, are placed on shelves near the ceiling of the room and connected by means of a fuse, B, which is proof against water and danger from rats: this fuse, being exposed to the flames wherever they may originate in the room, conveys the fire to the compound, and causes a simultaneous action, and extinguishes the fire without the aid of human assistance.

When the extinguishing compound is to be used by hand, the fuse is ignited and the mass, which is enclosed in a suitable box, thrown into the burning room. The fumes developed penetrate every available space, and smother the fire by evolving fumes of sulphurous acid and carbonic acid gas. The affinity of the sulphurous acid for the oxygen of the air, which it seeks to extract for the purpose of forming sulphuric acid, prevents, it is claimed, every other process of oxidation in the room, while the carbonic acid checks the progress of the fire and stifles it. This joint action of the sulphurous acid and carbonic acid gases renders the compound especially effective in cases where large quantities of coal oil, turpentine, spirits, grease, and similar substances, become suddenly ignited. It is especially well suited for use on board ships. The manufacturer informs us that over forty practical demonstrations have been made with this extinguisher in this country, and in various European states its use has been made compulsory by state and municipal authorities.



AUTOMATIC FIRE EXTINGUISHER.

For further particulars, address the patentee, Mr. Armin Tenner, 203 Vine street, Cincinnati, Ohio. The Unexcelled Fireworks Company, 112 Chambers street, New York city, are manufacturers and general agents for New York, New Jersey, and the New England States.

Colored Inks for Stamping.

The following are commended for the colors most frequently wanted for stamping purposes:

Red: Dissolve ¼ oz. of carmine in 2 ozs. of strong water of ammonia, and add 1 drachm of glycerin and ¾ oz. of dextrin. *Blue:* Rub 1 oz. of Prussian blue with enough water to make a perfectly smooth paste; then add 1 oz. of dextrin, incorporate it well, and finally add sufficient water to bring it to the proper consistence.

TO MAKE COMPOSITION ORNAMENTS FOR PICTURE FRAMES, ETC.—Mix whiting with thin glue to the consistence of putty. Have the mould ready, rub it over with sweet oil and press the composition into it. When a good impression is produced, take it out and lay it aside to dry. If it be desired to fit the ornament to a curved or irregular surface, apply glue and bend it to the place where it is to be attached before it gets dry.

On Feeding Horses New Hay and Oats.

The question whether horses are injured by being fed on new hay and fresh oats has been made a subject of investigation by a French military commission, who have been experimenting upon cavalry regiments. The *Kamerad* reports that the results of the experiments prove that the health of the horses was not essentially injured by new hay if they received the ordinary regulation ration along with other fodder. Some animals were at first rather less active and more quiet, they sweated more freely, and the excrements were somewhat softened; but in a short time this ceased. In general, the horses ate the new hay more willingly than the old. They retained the same strength and corpulence as before. The hair kept bright, the health perfect. Of 150 horses from 4 to 13 years old, with which the experiments were instituted, 37 gained in fatness, and 18 in strength and endurance. Only 18 lost flesh, and 8 lost strength, while 79 remained unchanged. A second series of experiments upon 150 horses gave the same results. On the other hand, another series of experiments was less successful, where 74 horses, from 4 to 13 years old, were fed exclusively with new hay, the quantity being increased until it equaled the regulation ration of old hay, straw, and oats together. On this feed there was no real sickness, but a general weakness, frequent sweat, loss of appetite, digestion disturbed, diarrhœa, relaxation of the muscles, weariness, etc.

The decision of the commission was that new hay can replace old hay in the regular rations without injury, and perhaps with advantage, but that to feed them exclusively on new hay is injurious to the horses.

Experiments were made upon 1,800 horses by feeding them on new oats, and were attended with favorable results, inasmuch as the animals nearly all increased in bulk and strength, from which the commission concluded that new oats can be substituted for old ones with advantage, and hence it is useless to wait two months after the harvest before permitting of the use of new oats. These experiments refute most positively the prejudice that still prevails in many places that feeding on new hay and oats is injurious to horses. On the other hand, it cannot be denied that horses, to which new hay is given, are frequently exposed to colic. The danger is only present, then, when the horses receive no definite rations, but have put before them as much as they can eat. In this case they not only eat much more new hay, but they also eat much more eagerly and greedily, which can be so much more injurious, as experience proves that those very horses which are most inclined to the colic eat most greedily.—*Industrie Blätter.*

The Velocity of Light.

M. Fizeau, whose name as an investigator of light is well known in the photographic world, has been followed up in his researches, it seems, by M. A. Cornu, so far as the determination of its velocity is concerned. M. Fizeau has made the subject of light quite his own, and in the early days of daguerreotype, he did much towards improving and elaborating the process. He it was who first of all distinctly comprehended the fact that so long as only one image could be secured by the daguerreotype process, the application of the latter must be very limited. It was his endeavor, after an image had been once secured, to produce therefrom other duplicate images—a problem which Fox Talbot had already solved in his process, which permitted of the production of negatives instead of positives. Fizeau's daguerreotype engraving process, by which he sought to convert the daguerreotype plate into a printing block, from which impressions might be printed in the press, although a singularly ingenious one, turned out of little practical value, since it was impossible to produce half tones by its means in any degree of perfection; and the strides made at the same time by the application of collodion and glass plates to photography at once placed M. Fizeau far behind, and he abandoned a line of research which, at one time, bade fair to ensure him considerable reward. But he did not forsake the shrine at which he had so long worshipped; he simply devoted himself to some other portion of the vast subject which he had made his own. This was to ascertain the velocity with which light travels, a matter which, as everyone who has studied light knows, is beset with peculiar difficulty. According to M. Fizeau's experiments, the velocity of light was 185,157 miles per second; and when we mention that, after some very elaborate researches undertaken by M. Cornu, this gentleman

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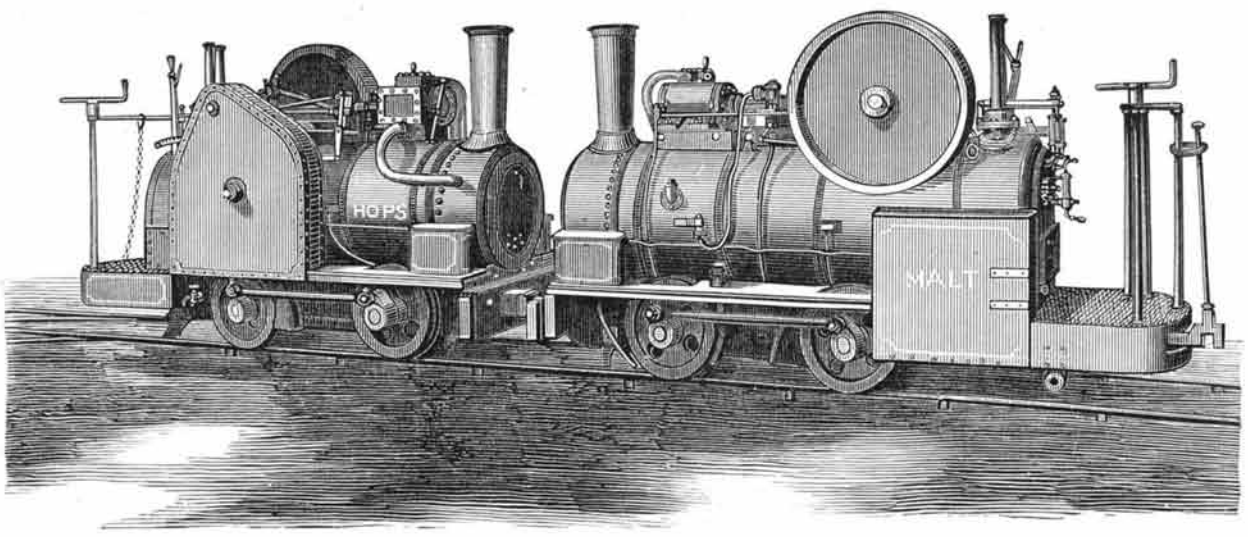
finds that the velocity is represented more accurately by 185,370 miles per second, we can only wonder at the accuracy with which M. Fizeau conducted his investigation. Unfortunately, in a delicate research like this, it is impossible to exclude errors of all kinds, and we must take, therefore, both the results of M. Fizeau and M. Cornu as approximate truths only; still they are both so near one another that we may, at any rate, conclude that light travels in any case at the extraordinary velocity of more than 185,000 miles per second. We have no such trustworthy data in respect to the velocity with which electricity travels, for in this case the estimates made by various philosophers differ widely from one another. Thus Fizeau estimates the velocity of the electric spark through iron at 62,100 miles per second, and through copper at 111,780 miles; while Wheatstone's results seemed to prove that the velocity was as much as 288,000 miles per second. Kirchhoff, the German philosopher, tells us that the motion of electricity in a wire where it meets with no resistance should be 192,924, which is the same as light *in vacuo*. Photographers may be interested to know how it is possible to determine the rate of traveling of so rapid a medium as light, and we therefore will try to explain the method adopted by M. Cornu in as few words as possible. There is a toothed wheel which revolves at a rapid and known velocity. A powerful ray of light, which may be termed pin-pointed, is allowed to pass through one of the niches in the wheel, and as the wheel revolves the point of light is obscured whenever a tooth passes. We will imagine the wheel at rest for a moment, and this ray of light shining through one of the niches. By having recourse to suitable lenses and a reflecting surface upwards at the proper angle, this ray of light is sent on a journey of 10,000 meters—in fact, from the Paris Observatory to the Fort Valerien, beyond the Paris fortifications. Arrived at this station, the ray is reflected back again whence it came, and with such accuracy that it touches the wheel in the same spot that it emerged from. The wheel is now set to revolve, and when at its full speed it may be found that two or three teeth pass in the interim of the light being passed and received back again, when it remains only to be calculated how long these two or three teeth were moving through space. As we have said, the rate at which the wheel revolves is well known, so that the time taken by that portion of it which is represented by two or by three feet is easily found, and this corresponds with the period which the ray of light took to travel the 20,000 meters to Fort Valerien and back again. This was M. Cornu's plan of examining the velocity, M. Fizeau, in his earlier experiments, having recourse to a much more restricted field of operations. Still, with all this difference, there is, as we have seen, but very little to choose between the results of the two French philosophers, and they are far better agreed upon the velocity of light than others upon the velocity of electricity.—*Photographic News.*

SMALL GEARED LOCOMOTIVES.

We illustrate herewith a pair of small geared locomotives designed and built at the works of Mr. Stephen Lewin, Poole, Dorset, England, for Messrs. Guinness & Co., Dublin.

The engines are in every respect similar except in name; the pair being shown in order to give both elevations. Each engine has but one cylinder, 6¼ inches in diameter, and with a stroke of 8 inches. The motion of the engine is conveyed by steel gearing to the traveling wheels, which are also of cast steel. When running at 280 revolutions per minute the speed of the traveling wheels is six miles per hour. A wrought iron clutch gear is arranged on each engine, so that they can be used for driving other machinery on the premises. The piston, valve rods, and all pins are of steel. The engine is carried on a strong bed-plate, fixed to wrought iron brackets riveted to the boiler, and suitable provision is made to allow of the expansion of the boiler. The regulator and other gear are all on the outside, and very easy of access. The boiler is made with double riveted longitudinal seams. The ordinary working pressure of steam is 140 lbs. per square inch. At the front end of the engine two buffers are fixed in the ordinary way, but the back or foot plate end is made semicircular, and is provided with a radial draw, to enable the engine to pass with the wagons round the very short curves which are frequently met with on the brewery premises; the sharpest of these is 12 feet radius; the gauge is 22 inches. There are also several inclines on the line, the steepest being 1 in 30, and up to this a load of 16 tons is frequently taken, the engines being capable of pulling a load of about 40 tons on the level.

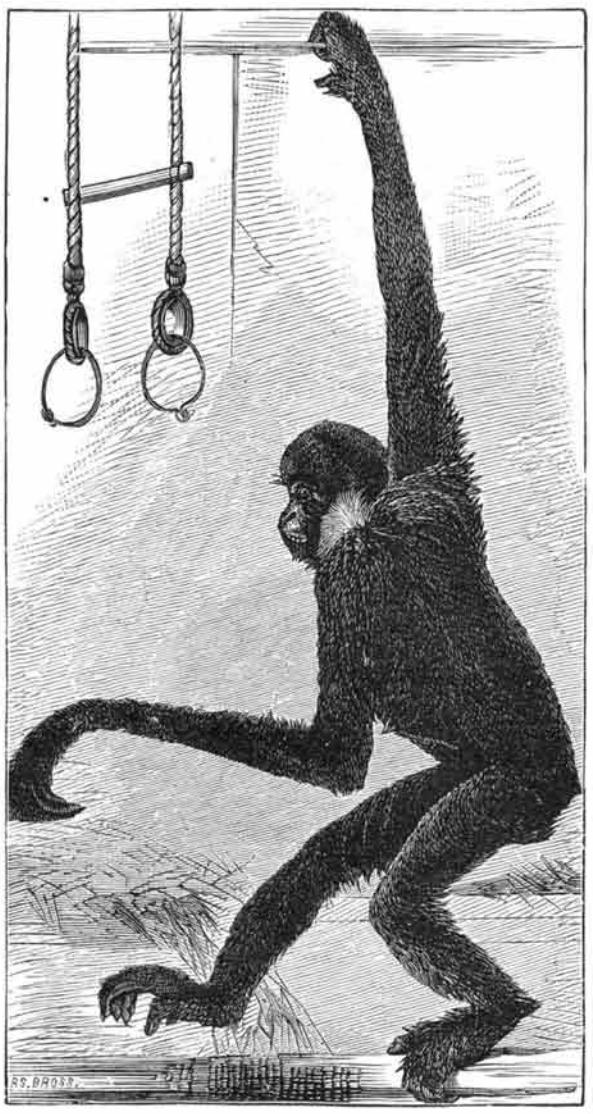
To suit Messrs. Guinness & Co.'s requirements the foot plate has been arranged to be easily taken down, so that the engine could be placed in their hoist and lifted to another level. The total width of engine does not exceed 4 feet over all, and the height, from top of rail to top of chimney, 6 feet; and the length with foot plate removed, 8 feet. The water is carried in tanks fixed between the frame plates and the coals in a bunker bolted to the side, as shown in the illustrations.



SMALL GEARED LOCOMOTIVES.

THE WHITE CHEEKED GIBBON.

The Gibbon belongs to that species of apes which have been called wood walkers, from their agility in swinging from tree to tree. They seem to form the connecting link



between the apes and the baboons. The arms are of enormous length, almost reaching to the ground when standing erect, and when extended are twice the length of the body. In height the gibbon rarely exceeds four feet, and many are less than three feet. The fingers and toes are long, flexible, and deeply serrated from one another. The thumb or anterior finger is completely opposite to the other four, as well on the hind as the fore limb. Thus their hands and feet are equally well formed for grasping, and can be used indiscriminately.

The gibbons are the most active of the quadrumana in the trees, but are very awkward on the ground. They are very shy in their native haunts, but in captivity are very gentle and docile. In their wild state they generally live together in pairs. The animal from which our cut is taken is termed the white cheeked gibbon, and is an inmate of the Zoölogical Society's Gardens, of London, England.

Colored Cigars.

Our readers seem greatly interested in the preparation of tobacco for use, and to some of them it may be of interest to know how the Havana cigar of commerce is dyed or colored to suit a peculiar taste for dark cigars. F. W. Haase, of Bremen, says that the artificial coloring of cigars is increasing almost daily in importance and extent. It is an established fact, he says, that the greater part of the smoking public prefer dark to light colored cigars. From statistics collected in Haase's business it appears that 76 per cent of the buyers order dark colored and only 24 per cent light colored cigars. It is, moreover, a well known fact that most smokers prefer a cigar of uniform brown color to uneven, red, pale, or spotted cigars. The color of all raw tobacco inclines more to light than dark, and the different poor crops of the past years have furnished much tobacco of a bad color. Under these circumstances, and with the large demand for finely colored and dark wrappers, and the small importation of such, a large stock of light colored and poor colored tobacco has been accumulating. In many places goods of a light or especially bad color can readily be obtained at very low prices, and hitherto the only question has been how to sell these old stocks for good wares and at good prices.

To help this need, stains for coloring light or bad colored cigars were offered some time since in various places under the name of "Havana brown," "soft brown," "condensed sauce," etc., which were purchased and used by a large number of manufacturers and dealers in cigars. The article has already an extensive sale, and the results which can be obtained by artificial dyeing are very profitable. Haase volunteered to prove it by sending to those who desired it samples of dyed and undyed tobacco leaves for comparison.

The different stains, remarks Haase, although they all consist of tolerably harmless ingredients, are neither especially appetizing nor justifiable, as they are mostly dilute extracts of dyewoods in ammoniacal solution, and do not contain any of the natural coloring matters of the tobacco, hence cannot replace them. An analysis of the so-called "Havana brown," made by Dr. L. Janke, in Bremen, showed that it consisted of a solution in ammonia and water of a vegetable dyestuff, which contained no material coloring of tobacco, but could be obtained from any colored wood. Dr. Hager suggests that it may be obtained by extracting peat with ammonia. Other stains gave similar results.

This artificial dyeing of cigars has as yet attracted but little attention among smokers, and is conducted very quietly and is apparently harmless, yet under all circumstances it should be condemned. Every artificial change of a natural product like tobacco, to give it a better appearance, should of itself be branded as improper. Then we must take into consideration the fact that the natural color of the cover has an essential influence upon the strength of the cigar, and consequently most smokers place great value on the color. By artificial coloring, on the contrary, the judgment is deceived, and it makes it impossible to determine the quality of the cigar from the color of the cover; for every dealer now has it in his power to make splendid dark cigars from his very light ones without any trouble. But we have especially to notice that now poor colored and refuse cigars may acquire a fine color and be sold for good ones. On all these grounds, dyeing cigars must be ranked as an adulteration for the purpose of swindling the public. Unfortunately no means has yet been devised whereby the people can distinguish such cigars in all cases from the genuine. All we can do at present is to call attention to the fact and recommend caution in the matter.

A Brave Engineer.

A little railroad accident recently occurred at the Cincinnati, Hamilton and Dayton Station, which might have been serious but for the prompt action of Engineer Whalen. The theatre train was standing in the station nearly full of passengers, and the engine, detached, standing some distance in front of it, when a freight train was, by some blunder, backed down at a rapid rate directly toward the passenger train. Fortunately, Billy Whalen, the engineer in charge of the engine, saw the situation, and, understanding the danger, sprang at once into the engine, which was yet detached from the passenger train, and, turning on full steam, shot her ahead into the rear of the coming freight train. The shock was a terrible one. The trucks of the rear car of the freight train climbed up the front of the engine; the head-light of Whalen's locomotive was smashed and considerable other damage incurred. The bold Billy was badly shocked, but the force of the freight train was checked, and though it struck the passenger train, driving it back to the rear of the depot and shaking up the passengers at a pretty lively rate, none of them were seriously injured, for all of which they may thank the quick-witted and brave Billy Whalen. Such an action requires more true heroism than is embodied in a thousand strikes.—*Cincinnati (O.). Enquirer.*

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Heat, Light, and Actinism.

We may apparently have heat without light, and light without heat, says Dr. Draper in *Harper's Magazine*. In the darkest room we cannot perceive vessels filled with boiling water, yet the warmth we experience on approaching them assures us that they are emitting radiations. Is not this heat without light? If we stand in the rays of the full moon, we cannot detect any decrease of temperature. Is this not light without heat? It is true that in this latter instance we are mistaken as to the fact; but overlooking that—for the heat to be detected in the moonbeams requires the most sensitive apparatus—do not such observations assure us that heat and light are independent of each other, physical principles having an existence separate from each other?

Such were some of the arguments on which were sustained the hypothesis of the intrinsic difference of light and heat. In this no account was taken of the optical functions of the eye. Qualities were incorrectly attributed to radiations which which, in truth, were due to peculiarities in the organ of vision.

The great service which the diffraction spectrum has rendered to science is the abolishment of all these imaginary independent existences—heat, light, actinism, etc.—and the substitution for them of the simpler conception of vibratory motions in the other. The only difference existing among the radiations that issue from a grating, in the manner we have been describing, is in their wave lengths, or, what comes to the same thing, in their times of vibration. The diversity of effects produced depends on the quality of the surface on which they fall. If on a dark surface, and the more so in proportion to its blackness, they engender heat; if on the retina, they are interpreted by the mind as light; if on photographic preparations, they produce decomposition, designated actinic effects.

Heat, light, actinism, are, then, not natural principles existing independently of each other, but effects arising in bodies from the reception of motions in the other, motions which differ from each other in their rapidity. Of those that the eye can take cognizance of, the most rapid impart to the mind the sensation of violet light; the slowest, the sensation of red; and intermediate ones, the intermediate optical tints. Colors, like light itself, are nothing existing exteriorly. They are merely mental interpretations of modes of motion in the ether, and in this they represent musical sounds, which exist only as interpretations by the mind of waves in the air.

THE WHITE BRUGMANSIA.

All who aim at making the greenhouse or conservatory beautiful and picturesque with the smallest amount of trouble have a valuable aid in this well-known plant. Planted out in a bed or border of any kind, and without any special culture beyond allowing it plenty of root room and water, it quickly becomes a handsome bush. It is also generally so healthy and vigorous that year after year it is a source of pleasure. The long and fine white fragrant trumpets are produced plentifully, and are seen to advantage among the soft and ample fresh green leaves. They last a long time in flower, often appearing till nearly the end of the year. It is fitted for walls in certain positions as well as for beds and wide borders, and it is particularly valuable in large cool houses where more natural verdant effects are sought than are obtainable by means of plants in pots.

Improved Method of Plastering.

Mr. Hitchings, of Stoke Newington, England, has introduced a new method of forming ceilings and other plaster work which, for durability, saving of time, and cleanliness, is unrivaled. By means of this system the plaster is prepared beforehand in slabs, which are fixed expeditiously to the joists, forming the ceiling at once as it would be when lathed and plastered with the two coats of lime and hair in the old process. The slabs or sheets are made in the following manner: A layer of plaster of Paris in a moist or plastic state is spread evenly on a flat surface surrounded by raised edges of the form to produce the desired bevel of the edges of the slab or sheet, and upon this first layer of plaster is laid a sheet of canvas or other woven fabric of proper size, or a thin layer of loose fibers, which is made to embed itself into and adhere to the plaster. Two laths are then laid along two opposite edges of the canvas, upon which another layer of plaster is spread evenly, and before it sets a rough broom is passed over the surface of this second layer of plaster to form a key for the finishing coat. When the plaster is set the slabs are nailed to the joists, as before mentioned, and the joints are made good with plaster of Paris. The third or finishing layer of lime and plaster is then applied to the ceiling in the ordinary way. Besides the advantages derived from rapid fixing, with the minimum of dirt and inconvenience, the new ceiling is practically uninflammable, and very economical to put up. Moreover, unlike the old plaster ceilings, it can never become detached from the joists; in fact, besides being self-supporting, it braces and strengthens all partitions and slight timbers.

ALUM and plaster of Paris, mixed with water and used in the liquid state, form a hard composition and a useful cement.

Progress of the Patent Purifier.

The war instituted by the Cochrane patent owners, known as the purifier ring, against the millers has now become general throughout the whole country, so says the *Mill Stone*. Emboldened by their temporary success in the case of J. A. Christian & Co., at Minneapolis, the American Middlings Purifier Company have, during the last two months, commenced a large number of similar actions for preliminary injunctions against the leading millers in every part of the country. By bringing a number of such suits simultaneously in various parts of the country, and creating the impression that they can compel all the principal millers, as well as the smaller ones, to either shut down their mills or furnish bonds ranging in amount from $50,000 to 100,000, the purifier ring seems to aim at securing as many settlements as possible, and gather all the prestige and "sinews of war" they can from such source before a trial of their case on its real merits can be forced upon them. We say this seems to be their policy, and it is so regarded by the leading millers and their associations, all of which are gaining strength daily and becoming more and more determined to contest the matter, directly through the courts, even up to the court of last resort, notwithstanding any and all of the numerous and industriously circulated reports of the ring and its agents to the contrary.

In Missouri and Indiana the war is already fairly inaugurated; and instead of having the effect of weakening the defensive associations, as anticipated by the ring, it has had exactly the contrary effect, the millers throughout those States having at length become fully awake to the importance of sustaining each other and making common cause against the demands of the ring, which they consider not only extortionate, but based upon fraud of the worst character, and which they regard it a matter of principle as well as vital interest to defeat.

In their application for an injunction against the Haxall-Crenshaw Company, Cochrane *et al.* give the history of the Cochrane patents, which the *N. W. Miller* condenses as follows:

In 1863 Cochrane, assignor unto himself and Warder & Child, was granted three patents, one of which was for an improved method of bolting flour; the second and third for improvements in bolting chests.

In 1873 Cochrane assigned one half of his remaining undivided interest to Rodney Mason.

In 1874 Child assigned his interest to Warder.

In 1874 Cochrane, Warder & Mason surrendered these patents and obtained reissues (for altogether different claims).

In 1874, April 27th and August 26th, Benj. H. Warder assigned all his interest to Wm. Warder.

THE WHITE BRUGMANSIA.

August 18, 1875, Cochrane, Warder & Mason assigned an undivided one third interest in the original and reissued patents to Chas. F. Peck, J. M. Van Buskirk, J. A. Evans, W. S. Cox, and W. H. Phillips.

March 22, 1877, the alleged Cochrane, Warder, Mason, Peck, *et al.* formed themselves into the American Middlings Purifier Company.

In this connection it may be said that Cochrane and Warder had failed utterly to make the machine for which the original patents were granted of any use; and that its use has been discontinued in the only mill where it was ever tried; and that the so-called American Middlings Purifier Company has never, to our knowledge, says the *N. W. Miller*, built, put in operation, or sold a middlings purifier, nor instructed a single miler in their "process" of making flour.

CEMENT FOR COATING ACID TROUGHS.—Melt together one part pitch, one part resin, and one part plaster of Paris. The ingredients must be perfectly dry.

THE MODERN HYPOSULPHITE OF SODA.

BY RUDOLF WAGNER.

The confusion which for some time past has begun to slip into the technical periodicals, in regard to the designation of two oxysulpho compounds of sodium, induces me to make the following notice.

Until very recently we understood, by the term hyposulphite of soda, the sodium salt of the acid $H_2 S_2 O_3$; this compound was also called sodium dithionite, sodium hyposulphite, and the author designated it, in the *Pharmacopœia Germanica*, published 1872, as *natrum subsulphurosum*. (The same term appears in the German Pharmacopœia translated by C. L. Lochman, published by Edler & Co., Philadelphia, 1873, page 188). On account of its use in bleacheries and paper mills to remove the excess of chlorine, the (old) hyposulphite of soda is called antichlor, although, since the Vienna exposition of 1873, several German manufacturers have sent their sodium bisulphite into the world under this name.

The name of hyposulphurous acid for the compound $H_2 S_2 O_3$ has become impossible since the discovery of the acid $H_2 SO_2$ or SO,H_2O, by P. Schuetzenberger (*Comptes Rendus*, 1869, LXIX, 169). To this is added the important circumstance that the acid $H_2 S_2 O_3$ is no longer regarded as S_2O_2, H_2O, that is, as a lower degree of oxidation of sulphur, standing below the sulphurous acid in the series, but as sulphuric acid in which 1 atom of oxygen is replaced by 1 atom of sulphur, hence its formula is: $SO_2 \begin{cases} OH \\ SH, \end{cases}$ and all the decompositions of the acid and its salts harmonize with this supposition. Hence it is no longer possible for it to retain the name of hyposulphurous acid, but must be called, as is already done here and there, thiosulphuric acid. The (old) hyposulphite of soda, therefore, must retain in future the name of sodium thiosulphate, or thiosulphate of soda. I would like to suggest that in manufacturing industries and among chemical dealers the soda salt be called simply "thiosulphate," just as sodium sulphate is called "sulphate" for short, and, to avoid any confusion in ordering or using it, to restrict the name of antichlor to sodium sulphite. The name of sodium hyposulphite, the (old) hyposulphite of soda, naturally disappears, while the designation dithionite is permissible, or, at least, not incorrect.

The acid of the modern hyposulphite of soda belongs to the same series as the other technically important acids of sulphur, and fills a previously existing gap, as will be evident from the following arrangement:

SO, sulphur monoxide, or SO, $H_2O=H_2 SO_2$.
SO_2, sulphur dioxide, or SO_2 $H_2O=H_2 SO_3$.
SO_3, sulphur trioxide, or SO_3, $H_2O=H_2 SO_4$.

The first of this series is the hyposulphurous acid of Schuetzenberger, which the discoverer named hydrosulphurous acid (*acide hydrosulfureux*) and thereby gave impetus to error and confusion. K. Kraut gave to this acid the name of water-sulphurous acid (*Wasserschweflige Säure*). There is no doubt that this acid is hyposulphurous acid. Berthelot recognized this fact in a paper published within a few months upon the thermal properties of the new acid, in which he said "in a rigorous nomenclature we are compelled to reserve for this acid the name of hyposulphurous acid." In the new textbook of chemistry published by H. E. Roscoe and C. Schorlemmer, Professors in Owen's College, Manchester, England, the name of hyposulphurous has already been introduced for the acid discovered by Schuetzenberger. In Fowne's "Chemistry" the names are also employed in this manner.

It is surprising that the hyposulphurous acid was overlooked for so long a time, although many reactions from distant and recent times indicate that the experimenters had the new acid in their hands, especially where sulphurous acid came in contact with active reducing agents. As early as 1789, Berthollet made the observation that metallic iron dissolved in an aqueous solution of sulphurous acid, without any gas being evolved; and nine years later Fourcroy and Vauquelin noticed that zinc and tin likewise dissolved in sulphurous acid without gas being liberated. In 1850 Schoenbein brought an aqueous solution of sulphurous acid into contact with phosphorous acid; he obtained a liquid which reduced indigo blue, probably because the phosphorous acid had reduced the sulphurous acid to sulphur monoxide. By warming the phosphorous acid with sulphurous acid, no hyposulphurous acid was formed, but beside phosphoric acid also sulphydric acid.

As already stated, P. Schuetzenberger in 1873 was the first who discovered the (new) hyposulphurous acid, and sought to make use of its powerful reducing properties in the arts. It is prepared by digesting granulated zinc, or zinc dust, in a closed vessel, with a cold saturated solution of sulphurous acid in water. The zinc dissolves without any evolution of gas, and in the solution will be found hyposulphite of zinc.

a. $H_2 SO_3+Zn=Zn SO_3+H_2$;
$Zn SO_3+H_2+Zn SO_2=H_2O$.
Zinc sulphite. Zinc hyposulphite.

In preparing the sodium salt of the formula $NaHSO_2$ (the second atom of hydrogen is not replaceable by a metal), the zinc is digested with a cooled concentrated acid solution of sodium sulphite, and the solution allowed to stand over night in an ice chest, when a double salt ($Zn So_2+Na_2 SO_2$) crys

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talizes out. The liquid remaining over the crystals will, if cooled more and left standing a long time, yield a crystalline mass consisting of colorless needles, which must be pressed out and dried in a vacuum. Aluminum likewise produces a hyposulphite by digestion with aqueous sulphurous acid. The reaction of hyposulphurous acid to magnesium is very peculiar, for this metal dissolves with an abundant evolution of gas (hydrogen but no sulphydric acid). The process, about which I reserve further communication, seems to be a complicated one.

The aqueous solutions of hyposulphurous acid and its salts greedily absorb oxygen from the air and then pass into acid sulphites: $Na\ HSO_2+O=Na\ HSO_3$. A hyposulphite solution when kept a long time goes over partially into thiosulphate: $2\ Na\ HSO_2=Na_2\ S_2\ O_3+H_2O$. An aqueous solution of hyposulphurous acid likewise decomposes in a few days, forming milk of sulphur; at first this sulphuric acid is formed, but this at once splits up into sulphurous acid and milk of sulphur:

a. $2\ H_2\ SO_2=H_2\ S_2\ O_3+H_2O$.

b. $H_2\ S_2\ O_3=H_2\ SO_3+S$.

DeLande and P. Schuetzenberger first made use of its important reducing properties in the preparation of hyposulphite vat, by mixing a solution of hyposulphite of soda with mixture of finely ground indigo and sodium hydrate:

$$\underbrace{C_{16}\ H_{10}\ N_2\ O_2}_{\text{Indigo blue.}}+\underbrace{Na\ HSO_2}_{\text{Sodium hyposulphite.}}+2\ Na\ OH=$$

$$\underbrace{C_{16}\ H_{12}\ N_2\ O_2,\ NaO}_{\text{Indigo white soda (hyposulphite bath).}}+\underbrace{Na\ HSO_3}_{\text{sodium bisulphite.}}.$$

The hyposulphite vat is used in the place of the vitriol vat in dyeing as well as printing with indigo.

Hyposulphurous acid precipitates the metals from solutions of silver and mercury salts, for example, from silver nitrate:

$$2\ Ag\ NO_3+H_2\ SO_3+H_2O=Ag_2+H_2\ SO_3+2HNO_3.$$

Chloride of silver, when freshly precipitated, is reduced to silver by long digestion with sodium hyposulphite, a reaction by which the hyposulphite is distinguished from the thiosulphate. I cannot confirm the statement that copper is separated as regulus from copper salt solutions by hyposulphite; the black precipitate which forms after some time consists of sulphide of copper.

A solution of permanganate of potash is immediately decolorized by hyposulphite.

It is evident that the hyposulphurous acid and its alkaline salts will still find many valuable uses in the province of chemical technology and chemical technical analysis.—*Dingler's Journal.*

NEW BOOKS AND PUBLICATIONS.

INDUSTRIAL DRAWING. By D. H. Mahan, LL.D. Revised and enlarged by Dwinel F. Thompson, B. S. John Wiley & Sons, 15 Astor Place, New York. Price $3.50.

Dr. Mahan's work has been a standard text book for so long that it is hardly necessary here to refer to its particular merits. The present reviser has, however, made many important improvements, notably in rewriting the chapters on drawing instruments and their uses, and adding others on tinting, shadows, shading, isometrical drawing, oblique projection and perspective. The value of the book is thus materially enhanced.

THE THEORY AND ACTION OF THE STEAM ENGINE. By W. H. Northcott, C.E. Cassell, Petter & Galpin, Publishers: London and New York. Price $3.50.

To students, to the general reader who wishes to avoid technical dissertations, and to the professional engineer who desires a handy book of the A B C of his calling wherewith to refresh his memory, we can cordially commend this work. It is one of the clearest, best written treatises that have ever come under our notice. The author not only fully comprehends his subject, but he possesses the rare faculty of not letting his own knowledge blind him to the needs of others not so well versed or wholly unversed therein. Beginning with a chapter on the theory of combustion, he proceeds to its practical consideration, taking up one by one, and capitally elucidating them, the various considerations affecting the steam boiler. Having discussed the generation and properties of steam, he proceeds to motive power derived therefrom and concludes with chapters on varieties of engines, their relative efficiencies and how to test them. The arrangment is logical, the explanations must be clear to any one of average intelligence, and taken altogether we know of no similar work which we should prefer to place before the young student as a text book and guide. There are plenty of illustrations and numerous useful tables.

PRACTICAL HINTS FOR THE SELECTION AND USE OF THE MICROSCOPE. By John Phin. Second Edition. Industrial Publication Co. New York city. Price 75 cents.

"The object in view of the preparation of this book," says the author in his preface, "was the furnishing of a cheap manual for those who cannot afford the more expensive books of Carpenter, Beale, Frey, and others." It is a work of nearly 200 pages, well illustrated and containing the practical information which beginners in the use of the microscope especially need. Dr. Phin is a microscopist of deserved reputation, and the first edition of his book was generally commended. The present edition has been materially enlarged and improved.

A SYSTEM OF VOLUMETRIC ANALYSIS. By Dr. Emil Fleischer. Translated by M. M. Pattison Muir, F.R.S.E. Illustrated. Macmillan & Co, 22 Bond street, New York. Price $2.50.

This work divides volumetric analysis into a few great groups, points out the principles underlying each, illustrates such principles by practical examples, and in general inculcates the necessity of studying this method of analysis as a branch of the science of applied chemistry. A distinctive feature is the plan for the estimation of bases without previous separations. The translator has judiciously condensed the original, added some new processes and tables and the new chemical formulæ, and otherwise better adapted the book for practical use, rendering it in English, as it already is in German a standard work upon its special subject.

Inventions Patented in England by Americans.

From September 11 to September 17, inclusive.

BAYONETS.—E. Rice, Cambridge, Mass.
BINDING BOOKS.—A. Boehmer (of Philadelphia, Pa.), London, Eng.
IRONING MACHINE.—H. Monk, Troy, N. Y.
PINCERS.—A. F. Stow *et al.*, Worcester, Mass.
PROJECTILES.—J. G. Butler, West Troy, N. Y.
SEWING MACHINE ATTACHMENT.—W. Gay, Troy, N. Y.
SPINNING MACHINERY.—J. M. Pursey *et al.*, Wilmington, Del.
TESTING CHECKS.—F. Grafelman, Middle Village, N. Y.
TOY MATCHES.—J. G. Powell, Philadelphia, Pa.
WINDOW BLINDS.—A. E. Wemple (of New York city), London, Eng.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED VEHICLE RUNNING GEAR.

George R. Duval, Oregon City, Oregon.—This invention relates to an improved construction of gear for vehicles of all kinds, which admits the employment of iron or other metal for all the parts, and produces a strong and substantial supporting and connecting gear thereby. The axle may be formed of hollow pipes, with interior truss rods, when extra strength is required, the seats carrying in outside grooves the thimbles, which are securely attached by outer screws. To the arch of the front axle is attached the fifth wheel, that is bolted thereto to support the front of reach, through the end of which the king bolt passes in the customary manner. The front bolster is constructed of arched parallel plates or bars supported in end seats or lugs, and braced by a curved stiffening rod and screw nuts at the ends, and acts in the manner of a truss, and is supported in the center by the head of the king bolt. The wagon body rests on front and rear bars, and between the uprights or standards, which are bent of flat iron, braced by cross studs, and secured rigidly to the ends of the bars by fastening bolts and nuts. The reach is made of iron tube or gas pipe of suitable strength, and clamped in suitable manner to a coupling sleeve or thimble by collars and set screws, being capable of adjustment to different length by means of the adjustable collars and screws. In this manner a strong, substantial, and firmly braced iron running gear for farm, lumber, and other wagons requiring a certain strength is obtained, which may, by slight modifications, be also used for vehicles of all description, imparting to them a light and pleasant appearance in place of the clumsy and heavy wooden wagons at present in use.

IMPROVED FASTENER FOR THE MEETING RAILS OF SASHES.

Henry L. Clark and Augustus B. Smith, Chester, N. Y.—The object of this invention is to provide a simple and inexpensive sash fastener to be applied to the meeting rails of window sashes, which cannot be unfastened from the outside, and will prevent the window from rattling. When the window is closed it is fastened by turning a lever down into a horizontal position over a plate and swinging the latch over it, the curvature of the lever being such as to permit the notched part of the latch to slip over it. It is impossible to move either the latch or lever from the outside of the window, therefore the window cannot be opened from the outside.

IMPROVED FRAME BUILDING.

William R. Morris and Joseph Slanser, La Rue, O.—This invention relates to improvements in the method of constructing frame buildings by the use of planks of suitable length and thickness, so that the entire building may be finished in its several parts, and finally put up in strong and reliable manner and without skilled help. The planks are placed at some distance from each other and bolted firmly to the beams, which are made of several planks interposed between the upright planks of the posts, so as to form therewith a compound plank construction that gives strength and rigidity to the building. The lateral post connecting girders are passed through mortises of the plank posts and secured rigidly at the meeting ends or joint of two girders by a recessed key, that is first passed through the mortises of the post and then placed in position, the girder ends being then inserted and connected by a second recessed top key, of less width, which keys are both spiked to the girder ends, to unite the same. The keys and girder joint are finally rigidly locked to the mortises of the plank post by two wedge keys running in opposite directions to each other. In this manner the construction of the compound plank frame buildings is perfected and rendered stronger and more durable.

NEW TEXTILE INVENTIONS.

IMPROVED FABRIC FOR CARPET LINING, ETC.

Daniel G. Rollin, New York city.—This invention has for its object the production of an improved elastic fabric, which is useful for a great many purposes where a fabric possessing strength and elasticity is required, as, for instance, carpet lining, insoles for boots and shoes, etc., and is composed of vegetable or animal fibers, or of vegetable and animal fibers combined. The following is the process usually employed in the manufacture of the new fabric: The inventor gives in manufacture this formula: For making, say, one square yard of the fabric, take about one and a half ounce of cotton waste, about one fourth of an ounce of glue made into a sizing, and a sufficient quantity of water to perfectly saturate the fibrous mass. To this add particles of sponge, cork, raw cotton, or other suitable elastic substance; also about one sixteenth of an ounce of alum, acid, or any other astringent. The cotton waste should be finally reduced by pickers suitably adapted to the purpose. The wet mass is passed between wire cloth aprons and dried, when it is ready for use.

NEW AGRICULTURAL INVENTIONS.

IMPROVED GUANO DISTRIBUTOR.

Joseph P. Baker, Madison, Ga.—This is an improved device for distributing guano and other similar fertilizers. In construction it consists of a spout having a flared upper end containing a removable hopper, and having two free rollers geared together and operated by a crank. One of the rollers is grooved or fluted and co-operates both with the hopper to shake it and with the other roller to pulverize and feed the fertilizer, the whole forming a light and convenient portable hand-distributor.

IMPROVED STOCK FEEDER.

Osman M. Hayden and George A. Knowles, La Porte City, Iowa.—This invention is intended for the purpose of feeding ground or other feed to hogs, cattle, sheep, or colts in an economical manner, without deteriorating the feed by impurities or the breath and saliva of the animals, so that other animals are kept from it; and the invention consists of a trough with feed hopper having adjustable slide piece and stirring lever or levers. The feeder may be arranged for different animals by being made of different width and height, forming, however, in all cases an economical feeding trough, as there is no waste of feed nor soiling of the same by the animals, the feeding being readily interrupted, when one set of animals is fed, by dropping the slide piece, the next set taking readily the feed as it is delivered in fresh state to them by opening the slide.

IMPROVED COTTON HARVESTER.

John E. Watkins and Morris Sale, Smithfield, Ky.—This invention has relation to machines for picking cotton in the field, and the nature of the invention consists, first, in a novel combination of devices with an exhausting fan and a picker, whereby one of the transporting wheels, when rotated, operates continually to wind up a spring, which, in turn, gives rapid motion to a fan and picker; second, in applying the exhausting fan and picking devices on the end of a frame which is vertically adjustable on the main frame; third, in combining picking nippers with a nozzle which communicates with the fan case, which nippers will pick the cotton from the pods, deliver it into the nozzle, and keep the same clear. In practice a governor to regulate is used to regulate the speed of the fan. Steam may also be used to run the machine. The convolute spring that drives the fan is employed to get a reserved force for use while stopping to gather the cotton where the pods are thickest.

IMPROVED HARROW.

George D. Miles, Cairo, Pa.—The handles of the harrow are attached by screw bolts to the side sections in such a manner as to be detached for being both placed on one side section, when the same is used as a cultivator. The handles serve to raise the side sections in passing a stump, rock, or other obstruction, which is a great advantage in harrowing new ground or an orchard, while the coupled side sections without the middle section may be readily used for harrowing corn. The side sections or wings may also be provided with wheels turning on center pins attached by straps, the front wheel being made like a caster, so as to turn below the wings and admit the easy transportation of the harrow to and from the field. The middle section is first lifted up and the wings drawn by slight side draft under it, to be conveyed as sled or vehicle. The harrow is in this manner adapted in superior manner for the purposes of the farmer, as it may be more conveniently handled and applied for different work.

IMPROVED FRUIT DRYER.

William W. Ferguson, Healdsburg, Cal.—The object of this invention is to furnish an improved machine for drying fruit, which shall be simple in construction, convenient in use, and effective in operation, drying the fruit evenly and rapidly, and which may be constructed at comparatively small cost. The case of the machine, which is designed to be placed over or connected with a furnace, has a pipe inserted in a hole in its top to allow the moisture from the fruit to escape. In the front and rear sides of the case are formed large doors for convenience in putting in and taking out the fruit pans, and to enable the machine to be cooled off quickly when the fruit is to be taken out. To the upper and lower parts of the sides of the case are pivoted two shafts, to each of which are attached two chain wheels, around which are passed two endless chains, to which are attached fruit pans for receiving the fruit to be dried. The machine may be driven by steam power or horse power, as may be desired or convenient.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED CAR MOVER.

George W Leek, Terre Haute, Ind.—This invention is intended to provide an easily operated yet powerful device for moving cars on the track, and it consists of a wheel with lateral concaved knives, driven into the grooved circumference and biting into the railhead, said wheel turning, by a center pivot, in a forked lever arm, that is secured to the platform of the car. The knife wheel is turned and car moved by a pivoted spring pawl of a hand lever engaging a fixed side ratchet wheel of the knife wheel. The forward motion of the hand lever gives a purchase on the ratchet, which thereby turns the knife wheel, that bites, by the lateral knives, into the head of the rail, and transmits thereby motion to the car. The return motion of the hand lever passes the pawl back over the ratchet, so as to engage the same again by the forward motion of the hand lever. The car or cars are thus moved with ease by this simple and effective device to any point on the track or to the side track, as required.

IMPROVED RAILWAY GATE.

William I. French, Cainsville, Mo., assignor to himself and Peter Jacobs, of same place.—This invention is an improvement in the class of railroad gates which are suspended by rods and arranged to swing across the track, being operated by levers which are connected with movable track rails so as to be operated by a train approaching from either direction. The operation of gates thus connected with movable rails is liable to be hindered or prevented by ice, snow, stones, or other substances beneath the rails. This invention consists in suspending the gates by two parallel rods, and in operating the same by pivoted arms or levers, which are depressed by contact with the wheels of the locomotive. The operation is as follows: The wheels of the approaching train run upon and depress the levers, which draw down the short arm of these levers, and swing the gates so as to leave the track clear. The levers are of such length that they are constantly pressed downward by the wheels of the passing train.

IMPROVED LEATHER-ROLLING MACHINE.

Henry Hudson, Saltillo, Pa.—The object of this invention is to furnish an improved leather-rolling apparatus which shall be so constructed as to enable the pressure to be applied by steam power, and which shall be simple in construction and easily controlled. When the free end of the lever is pressed down, steam is admitted to the cylinder, which forces down the piston and applies pressure to the roller. When the foot is removed from the lever it is raised by the spring, which closes the inlet and opens the exhaust, and the piston and the roller will be raised by the spring. The bar is vibrated to roll the leather in the usual way.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED PASSE-PARTOUT MAT.

Samuel Philips, Paterson, N. J.—The object of this invention is to furnish passe-partout mats which shall be strong and durable. The body or foundation of the moulding is wood, and is made in long pieces or strips in the same way as other wood mouldings. To the face of the long pieces of moulding is glued torchon or other paper. The long pieces are then mitered into pieces of the proper length to form a mat of the required size, and the mitered ends of said pieces are firmly glued and nailed to each other. By this construction the paper in the angle of the mat will be even and smooth, and without any pull or tear, which cannot be the case when the paper is applied to the moulding after the frame is formed. The inside mat is placed in the rabbet formed in the inner edge of the back of the moulding to receive it and the picture. The outside mat is attached to the outward extension of the moulding. When the mat is small the extension may be a solid part of the moulding; but when the mat is large the extension may be a separate piece, securely nailed to the moulding. After the moulding has been put together to form the mat the paper upon the moulding and the inside mat are coated with French zinc, mixed with water and enough gelatine to cause it to adhere firmly to the paper, a little ultramarine blue being added to make the color a pearly white. This preparation gives a pure white color to the moulding and mat, and greatly increases the beauty of the mat.

IMPROVED MUCILAGE HOLDER.

George B. Wight, New York city.—This invention relates to such improvements in those mucilage bottles in which the mucilage is applied by means of a sponge attached to the cap of the bottle that the required quantity of mucilage is supplied directly to the sponge on turning the bottle, and the sponge kept moist for use by a small storage receptacle formed in the cap at the base of the sponge. The invention consists of the flanged cap of a mucilage bottle, having a central perforation and outer rim, that forms, with a circumferential flange of the cap, a space for fastening the base of the conical sponge, which is attached by a toothed ring, over which the flange is drawn. The interior of the sponge is conically hollowed out to admit the easy passage of the mucilage, and the shedding of the same into the space or reservoir between rim, flange, and ring when the bottle is placed in upright position after use

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IMPROVED APPARATUS FOR DEODORIZING GASES FROM RENDERING TANKS.

Charles J. Trotter, Chicago, Ill.—A vertical cylindrical shell or drum is provided and is closed at both sides by suitable heads, the lower one of which rests upon any suitable foundation. A receiving pipe is screwed into the drum near the lower head, and another pipe is screwed into the opposite side of the drum, a short distance from the lower head. An exit pipe extends through the upper head for conveying away the gases after they are treated in the apparatus. To a condenser connected with a sewer, and having a sewer trap for preventing back flow of gas, a funnel is provided for introducing the deodorizing agent, and an air cock for the escape of air from the apparatus. The manner of using the apparatus is as follows: The drum is filled with a suitable deodorizing liquid up to the pipe, and the pipe, being connected with the cooking or rendering apparatus, conveys the gas and vapor from thence to the drum, where they are forced through the deodorizing liquid contained in the drum and escape through the exit pipe to a condenser connected with the sewer, being freed from disagreeable smell. The escape pipe may be connected with a sewer, when the fumes of the deodorizing liquid which escape with the gas may, or the gas may, be conducted to the furnace of the cooking or rendering apparatus, when it will be consumed.

IMPROVED BRONZING MACHINE.

Laurent Poirier, Paris, France.—This invention relates to improvements in machines used for bronzing or applying any kind of colors, in a state of powder, to sheets or paper, sheets of metal, fabrics, etc.—that is to say, to apparatus for applying colors, in a state of powder, to any kind of sheets printed by any mode of inking, by means of mordant varnish, as, for instance, in lithography, copper plate printing, typography, etc. The bronzing or powdering cylinder is covered with velvet, flannel, etc. On the other extremity of the shaft of this cylinder is fixed a toothed wheel, transmitting its movement to a pinion dependent on another shaft, on which is mounted the friction bronzing cylinder, the movement of which is thrice as rapid as that of the bronzing cylinder. The friction cylinder completes the bronzing, and gives the bronzed surface the polish and brilliancy.

IMPROVED MACHINE FOR PRINTING ON GLASS, PORCELAIN, ETC.

Friedrich W Heuer, Vienna, Austria, assignor to Emil H. Neymann, New York city.—The object of this invention is to produce an effective machine for printing in quick and cheap manner labels, pictures, ornamental designs, etc., in one or more colors, on glass, porcelain, earthenware, and other rigid bodies of cylindrical surface, the colors being fixed thereon, so that the prints resist the influence of moisture, and dispense thereby with the paper labels or pictures applied or painted thereon by hand or in other manner. The invention consists of a machine in the nature of a printing machine, with adjustable revolving supports for the bottles or other objects to which the colors are to be transmitted. When the machine is set in operation, the bottle receives a rotary motion by the friction between the same and the printing block of the carriage, which friction is augmented by the adhesiveness of the color employed. The printing block is made of elastic material, and placed on a stiff wooden or other base plate, which is cushioned in suitable manner, so as to provide for the slight variations in the diameters of the bottles, and secure a uniform transfer of the color to the surface to be printed.

IMPROVED STOVEPIPE DRUM.

Moses P. Farnham, Kanawha, Cal.—The object of this invention is to furnish an improved drum which shall be simple in construction, easily applied to a stovepipe, and effective in use, enabling the most of the heat to be withdrawn from the smoke before it is allowed to pass into the chimney, and wholly preventing sparks from passing into the chimney. To a length of ordinary stovepipe are attached a number of longitudinal and radial flanges, to the outer edges of which is secured a larger pipe drum, the upper and lower ends of which are closed with rang plates or heads. The flanges pass upon both sides of the inlet holes down to the lower head, but do not pass up to the upper head. The next flanges pass up to the upper head, but do not pass down to the lower head. Between the end of the flanges that extend up to the upper head are formed the outlet holes. The flanges must be arranged to form an odd number of flues, and there may be one, two, or more sets of flues, as may be desired. With this construction the drum is designed to take the place of a length of stovepipe, so that there is no trouble in setting it up or taking it down.

IMPROVED WASHBOILER.

Mores Tanenbaum, Grafton, Ill.—The object of this invention is to furnish an improved apparatus for boiling and washing clothes, cooking food, and other similar uses, which shall be simple in construction, convenient in use, and will require but a small amount of fuel to operate it. The body of the boiler may be round or square, cylindrical or flaring, and of any desired side. It is supported upon legs of such a length as to raise it to a convenient height. In a hole in the center of the bottom of the boiler is secured the lower end of a pipe, which is open at both ends. The part of the pipe within the boiler is surrounded with a larger pipe, placed at the distance of a quarter of an inch or more from the pipe, and perforated with numerous holes. The larger pipe prevents the clothes or other objects being boiled from coming in contact with and being scorched by the hot pipe. This pipe also acts as a steamer to project small streams of water and steam through the clothes, which washes them quickly, and renders it unnecessary to use a washboard. The boiler is provided with a closely fitting cover, which is made in two parts or halves, having half-round notches formed in the centers of their inner edges to form a hole for the pipe to pass through, so that the cover can be removed without its being necessary to remove the section of pipe from the upper end of the pipe. The section of pipe is provided with a damper, to enable the draft to be controlled as desired. A compartment or vessel is so formed as to fit into the space between the side of the boiler and the perforated pipe, and which is provided with a closely fitting cover and flange. By the use of flange and bead, the two being placed in corresponding position on the vessel and boiler, the vessel is very conveniently supported and at a suitable elevation.

IMPROVED COMBINED FISH TRAP AND BUCKET.

James M. Lasater, Manchester, Tenn., assignor to Robert L. Lasater, of same place.—The object of this invention is to furnish an improved device for catching and carrying minnows and other small fish, which shall be simple in construction and convenient in use. The invention consists in the combination of the glass vessel provided with the funnel-shaped top, the shaft, the bait hooks, and the cord, the perforated vessel provided with the slides and the eyes, the rods, and the bail with each other; and in the combination of the glass vessel provided with the funnel-shaped top, the shaft, the bait hooks, and the cord, the perforated vessel provided with the slides and the eyes, the bucket provided with the eyes, the rods, and the bail. When the device is used as a trap the glass vessel is placed upon the top of the perforated vessel, and is secured in place by rods. When the device is used for carrying the fish the glass vessel is placed in the bottom of the bucket, the perforated vessel is placed upon the top of the glass vessel, and the three are secured together by rods, the glass vessel being thus protected against accidental breakage.

IMPROVED VENTILATOR IN THE WINDOWS OF BUILDINGS.

Lorenzo D. Harvey, Sheboygan, assignor to himself and E. J. Stewart, Genesee, Wis.—This invention consists in hinging a deflector to the sill of a window, which, when the window is open, directs the inrushing current of air toward the ceiling. It also consists in applying a flexible deflector to the upper rail of a window sash and to the window casing, to direct the current of air admitted through the upper portion of the window toward the ceiling. When not in use the deflector lies upon the window sill. When the lower sash is raised the inrushing current of air is directed toward the ceiling by the deflector, where it unites with the warmer portion of the air in the apartment, and becomes tempered before coming into contact with the persons in the room. When the upper window sash is drawn down so as to admit air, the inflowing current is directed upward, as in the other case. The flexibility of the deflector permits the required latitude of motion in the upper window sash. The advantages of this plan of ventilation are obvious. Drafts are avoided, while thorough and complete ventilation is secured.

IMPROVED MEASURING AND REGISTERING DEVICE FOR ASCERTAINING THE QUANTITY AND QUALITY OF DISTILLED LIQUIDS.

Carl Robert Wedelin, Götheborg, Sweden.—This invention has for its object to produce a simple and efficient means for ascertaining the quantity and quality of distilled liquids, thereby facilitating the work of inspection, and enabling a reduction in number of the inspectors. The invention consists in the combination, with the still, receiver, or vessel in which the liquid, on being distilled, is collected, of a larger measuring tank and a smaller testing reservoir, so constructed and connected together by pipes and valve mechanism that the filling of the measuring tank from the receiver will set apart a small quantity for testing the grade or quality of the liquid, which small quantity, on emptying the measuring tank, will be discharged into the testing reservoir—a register connected with the valve mechanism at the same time indicating the number of times the measuring tank has been filled and emptied, and thereby the quantity of liquid distilled. By the application of this invention the now frequent attention of inspectors is rendered no longer necessary; but one traveling inspector may be able to alone discharge the duties now imposed upon a number of local officers.

IMPROVED BILLIARD CHALK HOLDER.

Henry L. Wharton, Youngstown, O.—This invention relates to an improved chalk holder for billiard cues, by which the chalk may be conveniently applied to the tips without getting on the hands or clothes, and without breaking and scattering when dropped on the floor. The invention consists of a chalk-holding casing, with detachable lid and sliding chalk, placed on a spring-acted base plate or follower, having projecting teats or roughened surface. The chalk holder supplies chalk to the tip merely, and not to the cue, preventing thereby the marking of the billiard table by the cue. The chalk is inserted by pressing down on the same with the finger passed through the hole of the lid until the lid is in position. When the lid is to be detached the chalk is retained in similar manner until it is taken off.

IMPROVED CHECK VALVES FOR OIL PUMPS.

Amos M. Terrill, Petrolia, Pa.—The object of this invention is to provide a check valve for attachment to the working barrels of oil pumps that will retain the fluid and relieve the piston from the column of fluid contained by the well. As the piston rises the upward pressure of the liquid lifts the valve, and the liquid escapes through the apertures under the valve face to the tubing of the well. When the piston descends the valve closes, and prevents the return of the liquid to the pump barrel.

IMPROVED FAN ATTACHMENT.

George S. Riggs, Micanopy, Fla.—This invention relates to an improvement in fans for attaching to tables, and it consists of an oscillating fan supported by a standard attached to the center of a table and driven by means of a treadle through a suitable arrangement of levers and rods. When the treadle is worked by the foot the rod is oscillated, and the wings create sufficient motion in the air to drive off flies.

IMPROVED FIRE ESCAPE.

George S. Staples, Sherman, Tex.—The object of this invention is to provide a simple, inexpensive, and portable fire escape, that may be used for letting persons directly down from buildings, or for carrying them from the upper stories of buildings to other buildings at a distance or to the ground, as circumstances may require. A belt is provided to be clasped or buckled around the waist of the person desiring to escape. The block is provided with a hook, by means of which it may be attached to any fixed object in the burning building, and another block is provided with ropes, by means of which it may be attached to any solid object below or across the street, or to a building conveniently near the fire. The manner of using the fire escape is as follows: The block is attached by means of its hook to any convenient object having sufficient solidity. The other block is attached to any convenient object below, or to the upper or lower stories of a building. The belt is fastened around the body, and the clasp secured to the rope. The person either lowers himself by taking the rope in hand, or is lowered by persons from below.

IMPROVED PROCESS OF COLORING PHOTOGRAPHS.

Den Chamberlain, Winona, Minn.—This invention relates to an improved process for coloring photographs, by which the pictures are given a mellow tone and a life-like color without impairing the likeness. By attaching to the back of the picture a backing on which is applied certain mixtures to produce the effect. The pictures can be framed in the usual way.

IMPROVED COMBINED LETTER BOX, BELL, AND DOOR PLATE.

Costello B. Geer, Union City, Pa.—The object of this invention is to so combine a door bell, name plate, and letter box as to form a single simple device, in which the several features retain their separate functions and also co-operate for joint use. The improvements consist in general in hinging the door plate to the slot or letter hole in the door so as to cause it to fulfil both the functions of a door plate and a cover to said hole. It also consists in connecting the hinged door plate with a bell, so that when the cover is raised and a letter dropped into the letter box the bell is simultaneously rung and the occupants notified, and so that also when a call is made and the bell is not answered, the visitor may drop a card into the letter box within.

IMPROVED HORSE DETACHER.

George W. Atkins, Noble's Lake, Ark.—This invention is an improvement in the class of detaching apparatus in which the traces are attached to curved pivoted bars or levers having a spring catch or locking device, which may be retracted to release said bars or levers, and thus allow the traces to become detached and free the team from the vehicle. The detachment of the traces is effective in this case by means of a cord which extends through the carriage front or around the dasher, and is hence easily accessible to the driver. For peculiar construction and arrangement of the detaching apparatus proper, see patent.

IMPROVED PREPARATION OF CHEWING GUM.

Robert Cotter, Houston, Tex.—This invention relates to the novel treatment of Mexican gum (gum sapata) to adapt it to be put up as a merchantable chewing gum. The process of treatment consists in first pulverizing the brittle gum, then sifting the same, and afterwards subjecting it to a gentle heat to reduce it to the proper consistence. A little sugar is incorporated with the gum when in a pulverized state to make it palatable, while the pure but inert and plastic character of the native gum used as a basis renders it well adapted for the purpose without objectionable or harmful effect to the consumers.

IMPROVED SADDLETREE.

Henry C. Still and Joseph R. Still, Austin, Tex.—This invention relates to an improvement in riding saddles designed to secure greater strength in the pommel and fork, and it consists in forming the fork of the saddle tree and the pommel from malleable cast iron, and in one and the same piece, the neck of the pommel being cast hollow for greater lightness, with the upper end of the casting open, which opening is closed by a surmounting cap of wood or other material which furnishes the pommel.

IMPROVED REFRIGERATOR.

George Collins, Springwells, Mich.—This invention relates to an improved construction of freezing apparatus designed for the manufacture of ice and for the preservation of meats, fish, game, etc. It consists in constructing the hollow door of the apparatus with an opening at the top through which the space in the door may be filled with a refrigerating material from the same opening at the top of the refrigerator through which the freezing mixture is changed to the other three sides.

IMPROVED VAGINAL SYRINGE.

Dr. Robert H. Woodward, New York city.—In the local treatment (by astringents, etc.) of menorrhagia or prolapsus uteri, where it is essential that the patient shall be kept in a recumbent position, the syringes ordinarily used have proved defective or inefficient in operation mainly because no means have been provided for supplying air to take the place (to a greater or less extent) of the liquid when being removed from the vagina. The object of the patentee is to remedy this defect, and to this end an air-tube attachment is provided and used in connection with the syringe.

IMPROVED NURSING BOTTLE.

Moses A. Michaels, McKeesport, Pa.—The object of this invention is to improve the construction of nursing bottles, that are required to be kept sweet and clean, and which are difficult to be cleaned, so that they can be readily cleaned, and thus kept sweet and pure. The invention consists in a bottle made in two parts, and provided with a screw coupling for connecting said parts detachably with each other. The screws may be cast upon, soldered to, or otherwise connected with the two parts, as may be convenient, or as may be most suitable for the material of which the bottle is made. This construction enables the bottle to be taken apart and easily and thoroughly cleaned, so as to be kept sweet and pure.

IMPROVED HEATING ATTACHMENT FOR LAMPS.

Charles I. Payne, Binghamton, N. Y., assignor to himself and John W. Burnett, of same place.—This invention consists of a sheet metal chimney having a cast iron base and top piece, and provided with a mica window and a slide for covering the same. A sheet metal portion that is apertured centrally receives the lamp burner, which is provided with apertures for receiving the springs of the burner that are usually employed for holding the glass chimney. By removing the base piece the sheet metal portion may be placed on a larger burner, the springs of which slip over a bead and hold the metallic portion securely in its place on the burner.

IMPROVED OIL CAN.

William Y. Horne, St. Paul, Minn.—The object of this invention is to furnish an improved oil can, which shall be strong and durable, and not liable to be injured by careless handling or during transportation. A sheet iron case or jacket is made of such size as to receive within it an ordinary oil can and leave a narrow space between it and the can. The can is inserted in the jacket from the lower end. A wooden bottom is then inserted in the lower end of the jacket to rest against the bottom of the can, and the lower edge of the jacket is turned down upon it.

IMPROVED HYDRO-PNEUMATIC FIRE EXTINGUISHER.

Charles C. Hearle, Montreal, Quebec, Canada.—This invention relates to portable fire extinguishers, which are designed for throwing water by the elastic force of compressed air. This machine is designed to supersede fire extinguishers which depend for their power upon chemicals. By a simple but effective arrangement, air pressure to any amount required is produced, which will throw a stream of water fifty feet horizontally, and it has been fully proved to be a very efficient fire extinguisher. It has the further advantage of being suitable for such uses as watering sidewalks, lawns, or gardens, washing carriages, or for any purpose for which a stream of water is required. It is also claimed for it that it is cheaply made, requiring no special machinery for its manufacture, is not liable to get out of order, and, all its work being outside, its operation is easily understood; in all these particulars being a decided advance on any machine of the sort heretofore exhibited.

IMPROVED FOLDING WORKSTAND.

Ervin G. Gollner, New York city.—The object of this invention is to furnish an improved ladies' and children's workstand, which shall be so constructed that it may be folded into a compact form for storage or transportation, and which shall be light, simple in construction, and neat in appearance. The top of the stand is provided with a cord, chain, or other handle for convenience in moving it from place to place. The stands may be provided with baskets, the upper one of which rests upon the upper ends of bars, the middle one rests upon pins or small brackets, attached to the bars near their central pivots, and the lower one rests upon the upper ends of the feet, or upon pins or brackets attached to said ends. With this construction the stand may be folded into a very compact form for storage or transportation, the baskets being nested.

IMPROVED CIGARETTE MACHINE.

William Davies, Henderson, Ky.—This invention relates to apparatus or appliances for giving form to the filling core or bunch of tobacco to be shaped for cigarettes, cheroots, and cigars, and also for inclosing the same in paper or leaf wrappers when the finished articles are of cylindrical or nearly cylindrical or tapering form: and it consists essentially of a slack flexible apron or band secured at the ends, but adjustable as regards its length, and of a roller or bar, with side handles, for operating the same along an inclined or level platform. The flexible band has sufficient slack to allow the formation of a double fold. The tobacco filler or bunch is made by placing the tobacco in one turn of the fold and the roller or bar in the other, and moving the roller along the platform toward one end of the same, so as to revolve the filler or bunch on the band and give it the required shape, the wrapper being rolled on by the same movement, and secured by gum or otherwise.

IMPROVED TOILET MASK.

Nanette S. Emerson-French, New York city.—The object of this invention is to furnish, for the purpose of beautifying the complexion, removing moth, tan, and sunburn, curing eruptions and inflammation of the skin, and softening and healing the skin, an improved toilet mask, that fits neatly and yieldingly to the face, and forms a protection for the same against external influences. The invention consists of a toilet mask formed of an outer layer of suitable pliable fabric, and an inner layer of heating or medicated fabric. The toilet mask is to be worn at night, not being annoying on account of its pliability, and exerting a quickly healing and softening influence upon the pores of the skin, so as to remove impurities and beautify the complexion, and form, furthermore, a protection against the influence of the sun and the bites of insects in summer, and against cold winds, chapping, and frostbite in winter.

IMPROVED SECTIONAL PACKING BOX.

Gilbert Robinson, Jr., New York city.—The object of this invention is to furnish an improved packing box, which shall be so constructed that it may be readily taken apart and packed in a small compass for reshipment, and which shall be so strong as to withstand the outward pressure of the goods and the strain of handling. The improvement consists in making the edge pieces, which have heretofore been a single strip of angular sheet metal, in two parts or double, riveted to the outer and inner sides of the part of the box to which they are attached, and their free edges, that form the overlapping flange, riveted to each other. This construction greatly strengthens the box, and enables it to safely withstand the strain of the goods and of handling.

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Notes & Queries

(1) E. D. N. asks: What will take coal oil and black ink out of a board floor? A. To remove the oil, provided the floor does not contain an excessive quantity of it, sprinkle the boards with good benzine and cover the parts with fine dry pipe clay for several hours. Repeat this treatment if necessary. For the ink (if writing ink), after removing the oil moisten well with muriatic acid diluted with 3 or 4 parts of water and cover with pipe clay as before, but have it warm.

(2) A. M. asks: Is it injurious to health to have growing plants in one's sleeping room, during the winter? A. In close rooms some plants are undoubtedly capable of exerting pernicious effects, but if the number of plants is not great, and the apartment well ventilated no danger need be apprehended.

(3) G. B. says: In the process of sugar making I am using cypress cisterns, to receive cane juice, which have been through a process in contact with sulphurous gas. What kind of paint, varnish, or other covering can be applied to the inside of the cistern, leaving the cistern in a clean condition after washing? A. If you can make paraffin adhere firmly, this will offer most efficient protection—it may be melted and a thin coating applied with a brush to the perfectly dry wood. The cisterns should be occasionally cleaned and, if necessary, dried and recoated.

(4) G. N. L. says: In making an induction coil capable of throwing the spark 1 inch, how many feet and of what size wire will I require for the primary coil? How many thousand feet and of what size should be used for the secondary coil? Will cotton covered wire answer if each layer is insulated? Will a dozen ⅛ inch soft iron wires, 10 inches long, answer for the core? A. Make the core about 18 inches long and 1 inch in diameter, of small (No. 26), well annealed iron wires. Use for the primary coil No. 16 cotton covered copper wire, enough to make the thickness of the helix ¾ inch. For the secondary coil use No. 36 silk covered and well paraffined wire, enough to bring the outside of the coil 2 inches from the cover. Cotton covered wire may be used, but silk covered is best.

(5) N. S. R. asks: 1. What per cent of acid and water to use for battery for plating? A. Where other salts are not used add one twentieth part oil of vitriol to the water. 2. Also what percentage of blue vitriol, acid, and water for solution? A. Make as strong a solution of copper sulphate as possible. Do not use acid. In starting the battery a little zinc sulphate may be added to the zinc solution instead. 3, Is acid used to clean the form so that it will not blurr? A. No.

(6) E. N. asks: Can asphaltum be prepared cheaply to be pliable in freezing weather and in summer not to melt or run? A. No.

(7) P. R. asks: What book gives full information to make batteries and electroplate? A. Gore's "Electro-Metallurgy" is the latest publication.

(8) H. A. S. asks: Have any experiments been made to ascertain if carbonic oxide will pass through the walls of soapstone stoves? A. No.

(9) A. S. N. R. asks how to inlay a word in silver, on a flat gold ring? A. Engrave or stamp the design in the gold, then cover all except the portions to be silvered with wax, and deposit the silver by electroplating.

(10) J. N. P. asks how to make a fuse or slow match? A. Ordinary cotton cord soaked in a solution of saltpeter.

(11) I. N. G. asks how to transfer printed matter? A. Moisten the printed matter with a solution of caustic potash in alcohol and transfer by pressure.

(12) E. H. S. asks how to construct a simple apparatus suitable for distilling or condensing in a small way palatable fresh water from sea water? A. The simplest contrivance consists of, 1. A tin boiler as large as can be used over the fire available. 2. A rubber pipe leading from the steam space to a worm made by coiling said pipe in a tight cask kept replenished with cold sea water. 3. A reservoir at the delivery end of the pipe to receive the condensed steam. The quantity of water distilled depends on the size of boiler that can be used.

(13) J. R. says: A friend has a spring seventeen rods from his house; difference in level 28 feet (that is, spring lower than pump at house). He wishes to pump from the spring through a pipe laid according to the configuration of the ground, which is ridgy and uneven. Will it be a paying investment? A. No.

(14) A. J. G. asks how to mount maps? A. Stretch the cloth as tightly as it will bear on a frame of the required size. Rub over the surface a sufficient quantity of well cooked paste, made of equal parts of wheat flour and starch until the cloth is thoroughly wet. Lay the map upon the pasted surface and cover it with a piece of clean paper, rubbing back and forth, until it is smooth and fast. If desired, varnish with white copal varnish.

(15) W. A. T. asks: 1. How the peculiar grayish mottled appearance seen on rifle lock plates is produced? A. By casehardening. 2. How is the black blue finish given to the barrels? A. The work is highly polished or burnished. Placed in charcoal dust over a fire until the peculiar color appears.

(16) W. D. H. asks how to obtain a high polished surface on steel tools with emery wheels? A. Set the wheels with flour of emery to use as the last polish. A little tallow may be rubbed over the wheel as a finish. If the wheels are of small diameter, run them about two thousand revolutions per minute.

(17) W. G. says: I have a column 600 feet long and 12 inches in diameter in use for draining the water out of a coal mine. Sediment from the mine water has collected in the pipe, reducing the diameter to less than 6 inches, which causes a heavy strain on the joints. Is there any way of loosening the sediment so as to cause the water to wash it out, and so avoid the expense of taking the pipes apart? A. If the lead of the pipe admits of it, try to pass a chain through. Cutting projections might be fastened to the links to knock off the scale. To send the cord through the pipe wherewith to pull the chain through, if other means fail, attach a thread to a rat and drive the animal from end to end of the bore. Then pull the cord through by the thread. A steam jet might possibly be of benefit.

(18) J. H. McL. & Co. have paid out a large amount of money in trying to tan the skins of fresh water sturgeons without success. Have had some of the best tanners in the country trying to make some use of them. Can any correspondent suggest how to tan or handle sturgeon skins so as to make them useful?

(19) J. B. asks: Have vessels been built that could be propelled under water? A. Yes; the Ericsson, Lay and Whitehead torpedo boats. A submarine boat carrying a crew blew up the U. S. S. Housatonic during the war, but the crew were all lost. Numerous submarine boats have been patented.

(20) D. W. F. and J. W. P. ask: Of the colored glasses, which is the best for use in goggles to protect weak or sore eyes? A. The dark shade of carbon glass is perhaps preferable; it diminishes the intensity of light without perceptibly interfering with the colors. Colored light is of no special benefit to sore eyes.

(21) I. A. C. asks: How many feet No. 34 insulated copper wire will it require to make the magnets in either engine described in SUPPLEMENT No. 19? A. The rule is to make the thickness of the wire helices equal to that of the core. The amount of wire to be used will depend upon the size of core. It is advisable to use a larger wire—about No. 22. 2. How large a battery will it require to run the locomotive, size of the engraving? A. One cell of the bichromate battery will probably suffice.

(22) C. D. N. asks how to make a fluid that will renew the color of black cloth pants faded or stained by perspiration, etc.? A. In such cases it is advisable to have the article washed and re-dyed. The following is sometimes used as a reviver: Galls, 1 lb.; logwood, 2 lbs.; copperas, ½ lb. Crush, mix, and boil in five gallons of water until reduced to one gallon, and strain.

What will remove dandruff? Have used flowers of sulphur. A. Apply a solution of borax with a stiff brush.

There are several names for coal oil, such as benzine, kerosene, petroleum, etc. What is the difference between each? A. Kerosene, benzine, naphtha, etc., are all products of distillation of petroleum. When petroleum is heated in the retort, the lighter oils, such as gasoline and naphtha, distil over first, and are condensed in pipes surrounded by cold water. At a higher temperature oils of greater specific gravity (heavier) such as naphtha, benzine, etc., come over; as the temperature increases, kerosene distils. The residue in the retort contains tar, paraffin, and lubricating oils.

My watch case, keys, etc., turn black in my pocket in warm weather. What is the cause? A. The discoloration is due to sulphur compounds, either excreted with the perspiration, or existing in the atmosphere of a locality frequented.

How can I stop a hole in an india rubber foot ball? A. Use rubber cement.

What will drive mosquitoes out of a room? A. Oil of pennyroyal is often used. Almost any strong smelling (harmless) essential oil will answer.

(23) J. S. asks how to make a matrix of plaster of Paris? A. Use fresh calcined plaster mixed with water about the consistency of cream. Pour it slowly over the matrix and let it remain until it is hardened. Oil the matrix lightly before pouring. 2. Is there anything that will toughen the plaster? A. Mix with weak alum water instead of water, or use a solution of 2 ozs. of gum arabic to 1 pint of water. Or for common purposes a weak size of glue may be used.

(24) W. F. M. asks the number of heaped bushels contained in a wagon box whose length is 120 inches, width 40 inches, and depth 24½ inches? A. Size of wagon box 117,600 cubic inches, or about 44 heaped bushels.

(25) S. D. B. asks the number of cubic feet it takes to make a ton of hay? A. Any figures that can be given will only be approximate. Ordinary meadow hay, freshly stacked, contains from 260 to 280 cubic feet per ton, and becomes somewhat compressed after remaining in a large stack for some time. New clover hay occupies about 300 cubic feet per ton.

(26) B. & C. ask: How many cubic inches in a bushel (heaping measure) of green apples, Irish potatoes, etc.? A. A heaped bushel contains 2688 cubic inches, the additions being one fourth of a struck bushel. The standard bushel is the internal contents of a cone having a base diameter of 18½ inches, and 6 inches high.

(27) E. N. asks: What battery is the best for plating purposes? A. For small work a copper sulphate-zinc-copper battery, of the gravity form, is perhaps most convenient. Smee cells with carbon negatives, also the more powerful bichromate or carbon battery, are in common use where magneto-electric machines are not employed.

(28) M. D. asks: About how many square feet of heating surface are required in Ericsson's caloric engine to the horse power? A. From 8 to 10, in the small sized engines.

(29) T. D. B. asks: Would a vessel containing a vacuum be more buoyant than the same vessel filled with hydrogen gas? A. Yes. One hundred inches of pure hydrogen weigh a little more than two grains.

(30) G. W. S. asks: Is a local battery unhealthy if kept in use in the same room occupied by the operator? Is the vapor, if any, arising from the materials used unhealthy? A. If of the ordinary type—zinc and copper in solution of sulphates of these metals—no. The metallic salts used are not volatile at ordinary temperatures. The only exhalation is aqueous vapor—provided the materials used are not excessively pure.

(31) J. W. W. asks: 1. What is the cause of the evolution of heat when alcohol and water combine? What is the cause of the contraction which takes place when alcohol and water combine? A. It is due to contraction or a limitation of the atomic vibration. 2. Do the molecules of the alcohol and water when combined form intermediate molecules, or do they lay side by side with small shot? A. It has not been determined, probably the former. 3. Is the combination of alcohol and water chemical or mechanical? A. Chemical. 4. What is the greatest gravity of water? Some writers place it at 4·1° C. or 39·38° Fah., or for practical purposes, 39·4° Fah. Others 40° or 39·2° Fah. Which is correct? A. According to the latest authorities, maximum density of water is at 39·2° Fah. (=4° C.)

(32) G. F. S. asks: 1. How many feet of 1 inch pipe (heating coils) are required for heating every 1,000 cubic feet of air, in rooms exposed to northwest winds; and how many square feet of heating surface (boiler) are required for supplying every 100 feet of pipe in such rooms with good draught for boiler fire? A. From 7 to 9 of radiating surface, and 5 to 7 of boiler heating surface.

(33) J. P. asks: Which will require the most power, to raise water from a reservoir by setting the pump above the same, or to force the water out by setting the pump inside of the reservoir near the bottom thereof, the depth of the reservoir to be less than 25 feet? A. There will be no essential difference, all things being equal.

(34) A. K. asks: If the strength of the electric current produced by a magneto-electrical machine be "H" for a given velocity, how much electricity will be produced by running the machine double, and how much by running it four or six times that velocity? Has any formula been worked out by which to calculate this? A. The production of electricity by any dynamo or magneto-electric machine increases about as the motion increases, until a certain maximum is reached, which depends on the capacity of the machine; and then any increase of speed will not improve the current. No rule can well apply in this case; it is simply a matter of test; if your machine is driven by a steam engine, throw off the governor belt and speed up until you get the best result: then count the number of revolutions per minute.

(35) I. C. H. says: I use a telegraph key in a room where it is very moist and warm, in fact full of steam, and I have a good deal of trouble with it. It is very slow and will quite often miss a dot or a dash. What is the matter? Has the steam anything to do with it? A. Be sure that your battery is in good condition, then clean the contact points of your key; if then you find difficulty, then there must be an escape; carry your office wire entirely clear of the wall, and see that the base of your key insulates well.

(36) A. B. asks: Would there be any gain in the attractive power of an electro-magnet of the horseshoe form, by cutting it apart at the bend? That is, would the totality of power of all the poles thus created be more than equal to that of the magnet before the cut, battery power and coils remaining the same in each case? A. No, there would not; the attraction of a magnet depends on its tendency to close a magnetic circuit, and the best result is obtained by having that circuit, as nearly as possible, complete and uniform. Cutting the magnet as you mention, makes two electro-magnets, each one half of the original size, and with opposite, and therefore attractive poles together; and the only advantage as compared with its first form is that it will more readily lose its magnetism when the current is broken.

(37) V. A. S. asks if the white fish of the lakes will bite a hook? A. No.

(38) W. A. H. asks: 1. How many ⅛ gallon bichromate of potash batteries would it take to run a boat 18 feet long, of very fast model, at 5 miles per hour? A. Of course our answer must be regarded as approximate; about 25 cups. 2. What style of engine do you think most suitable and easy to construct? A. There is no particular choice. 3. About what would it cost to run it per day? A. About two dollars for battery and material.

(39) —— asks: Is there any such thing as having too much battery power for an electric bell? One cell will work it easily (though not very loud) while four cells will not work it at all. The battery is composed of lead and zinc, sulphate of copper and sulphate of zinc. What is the matter? A. Not in the case you mention; the fault is in the battery. Test each cell with the bell before you place it in circuit.

(40) R. P. S. asks if a wall (sea wall) laid in Portland cement would be a sure remedy against washing out in winter. It is all right in summer. A. A wall well founded, and built of dressed Maine granite laid in Portland cement, makes the handsomest and most durable sea facing: but of course it is very expensive. As your question is, we can only answer that enough of it, used judiciously, is the best remedy against washing out; but we could not give an opinion without seeing the place or knowing more of the circumstances; it may be that the stones are of poor shape, or too small.

(41) J. P. H. asks: 1. Is a single cell of Daniell's battery large enough to copper or electrotype articles two or three inches square? A. Yes, if it is clean and in good condition. 2. What is the cost? A. About $2.25 for a cell, complete, and with connectors.

(42) W. B. says: If alcohol be used in place of water in a hydraulic press there will be no trouble experienced from rust from the tank getting under the valves.

(43) J. L. F. asks: 1. Why the magnetic needle points to the north pole? A. It is caused by currents of electricity passing around the earth, in lines nearly parallel with the equator; this may be easily proved by winding 20 or 30 turns of insulated wire around a globe on lines about parallel with its equator, and sending an electric current from one or two cups of Grove's through the wire, when a magnetic needle placed on any part of the globe will point to the north pole of the globe, obeying the law that a magnetic needle

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tends to arrange itself at right angles to an electric current. 2. Can there be an electric light more brilliant than the sun? A. It is possible to produce a light of the same intensity, but never of the same quantity as comes from the sun.

(44) W. A. H. asks whether the new electric candles (2 carbon points lying side by side) require as great a number of elements as the ordinary electric light? A. No.

(45) S. B. G. asks: What is meant by the "harvest moon," and how often does it happen? A. It has been observed at the near approach of the autumnal equinox (September 22) that the moon, instead of rising as it usually does, later on one day than on the preceding one, rises on three or four successive evenings just as the sun sinks out of sight in the evening. This phenomenon is owing to the fact that the moon is in Aries when the part of the ecliptic below the horizon makes the least angle with it. In former times husbandmen, not doubting that it was so ordered on purpose to give them an increased supply of moonlight for their greater convenience in reaping the fruits of the earth, gave the name of "harvest moon" to this particular full moon.

(46) C. J. asks: What is the method by which the mould boards of plows are hardened? A. In some instances an iron pattern is placed in the sand mould when the mould board is to be cast, and the contact of the molten iron with this iron mould renders the casting very hard. In other instances different kinds of iron are melted together, the union of which produces a hard alloyed iron.

(47) G. G. P. asks: If a covering of brick with a layer of plaster of Paris under it serves a good purpose in retaining heat in a locomotive boiler? A. The plan is a very good one. Common wood ashes have been been used in place of plaster and covered with brick in the manner you propose.

(48) F. A. F. asks how to make shoemaker's ink? A. Alcohol 1 pint, tincture of iron 1½ ozs., extract of logwood 1 oz., pulverized nutgalls 1 oz., soft water ½ pint, sweet oil ½ oz. Put the sweet oil into the alcohol before adding the water.

(49) H. A. K. says: 1. I have a well and building 40 feet apart. I wish to put a pump in the building. What will be the difference in the power required to discharge a gallon of water in the building or at the well, the height being the same in both cases? A. The same power will be required for either arrangement. 2. Would it make any difference in the flow of water if the pipes turned at right angles or on a curve? A. It is much better to use curves with large radii.

How much water will a 12 horse engine require to be evaporated per hour for each working horse power used? A. From 30 to 100 lbs., according to construction and arrangement.

(50) H. L. B. asks for a method of fixing pencil drawings on paper to prevent blurring by rubbing? A. Take the white of one egg; mix thoroughly with one quart of water. Filter through a fine cloth. Flow the drawing with the albuminized water and let it dry.

(51) P. B. asks: Can brass be united to lead with a soldering iron or copper? A. Yes.

1. Can waterproofing alum solution be applied to wall paper? A. Yes. 2. Can I kalsomine over a whitewashed ceiling, the whitewash of which rubs off? A. Yes.

(52) A. G. says: We have a tug boat with a return tubular boiler, 5 feet shell over all; grate bars 22½ feet, heating surface as follows: furnace 40 feet, draught flue 16 feet. return tubes 247 feet, comb 7 feet. Top of fire chamber at the end of draught flues, 7 square feet, 18 inches. In burning bad coal or wood we cannot keep up more than 65 lbs. steam. We have also a locomotive boiler, 5 feet shell, 16½ feet from end of tube to outside of firebox, grate surface 22 feet, heating surface as follows: Tubes 595 feet, firebox 70 feet. We wish to burn wood altogether. Would we get more steam with the locomotive boiler? A. Yes, probably. But the data are hardly sufficient to give a decided opinion.

(53) C. L. M. asks for a recipe for making black ball and blue stencil paste for marking with stencils? A. For black ball use beeswax 8 ozs., tallow 1 oz.; melt and add powdered gum arabic 1 oz., and lampblack to color. For stencil paste, mix the required color with dextrin or gum arabic, moisten with water, press into cakes and dry thoroughly.

(54) L. S. writes: I have constructed a galvanic battery, using zinc and carbon with diluted sulphuric acid. It produced a very strong current till lately, when it almost ceased working. By examining the battery I found that the carbon connections, consisting of brass clamps, were all covered with a thick layer of verdigris, and almost corroded by the acid. I would like to know whether these connections could not be made of a metal less affected by the acid, say lead or some other composition? Will not lead weaken the galvanic current, and will the carbon be always of the same strength by always leaving it in the fluid, while the zinc plate is arranged to draw out of it? A. Lead is used for this purpose, but where the connection is exposed to acid, nothing seems to deliver the current to the carbon as well as a connector made or faced with a noble metal, platina, or gold. A brass clamp connector will answer very well if you have it 4 or 5 inches above the surface of the solution, so as to be above the reach of the solution drawn up by capillary attraction. Clean your battery, and use less solution; or you may use more solution if you protect the carbon connection by varnishing it (after it is well connected) with shellac varnish, or dipping it about an inch below the surface of melting beeswax. In either case the carbon must be dry and warm.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

H. S.- It consists principally of metallic iron. Owing to the limited quantity of sample, other constituents were not determined.—N. S.—It is a piece of glass.—S. A. T.—It is lignite in a sandstone gangue, which is of very common occurrence. It is sometimes called mineral charcoal.—J. V. H.—It is a variety of traprock.—A. H. McC.—You should send a specimen of the mineral.—J. L. P.—It is sesquioxide of iron or a ferruginous clay mixed with wax and oil.—J. S. C.—What you refer to is probably quartz—crystalized silicic acid. Its presence is not specially indicative of other minerals.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Meteor. By J. E. H.
On a Wheel with no Dead Center. By F. P.
On Cancelling Postage Stamps. By E. W.
On a New Method of Smelting Iron. By M. H.
On Cases of Lead Poisoning. By L. L.
On Stellar Systems. By G. R. C.
On How to True up a Crank Pin. By I. R.

Also inquiries and answers from the following:

G. A. G.—C. W. F.—W. H.—J. S.—M. H. R.—G. W.—F. F. O'K.—W. C. McN.—W. H. S.—H. D. O.—W. B. & S.—H. D. L.—A. R. C.—W. V. P.—A. H. B.—G. A. M.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who manufactures machinery for making flowerpots? Who makes and sells an article for preventing or removing scale in steam boilers? Who sells books on tanning, leather finishing, and copper smithing? Who deals in rosin?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 11, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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10,233.—HASSOCK COVERING.—C. H. Bartlett, Cambridge, Mass.

10,234.—HANDLES FOR DISHES.—J. W. Burgess, New York city.

10,235.—SPEAKING TRUMPETS.—E. Cairns, Morristown, N. J.

10,236 and 10,237.—EMBROIDERY PATTERN.—E. Crisand, New Haven, Conn.

10,238 to 10,247.—BACKS OF PLAYING CARDS.—A. J. Manning, New York city.

10,248.—COOKING RANGE.—N. S. Vedder, Troy, and T. S. Heister, Lansingburg, N. Y.

10,249.—PARLOR WOOD STOVES.—N. Brayer, Rochester, N. Y.

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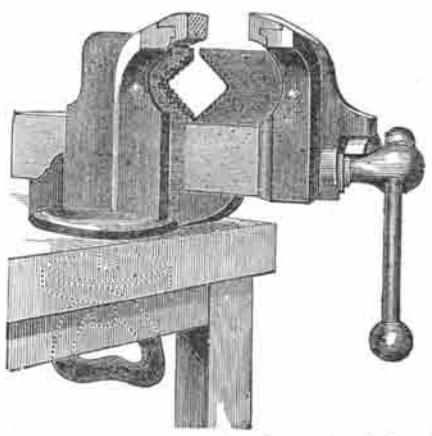

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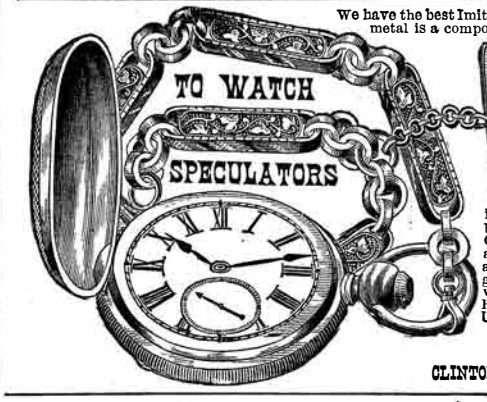

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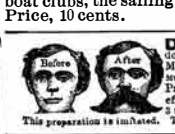

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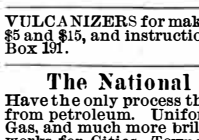

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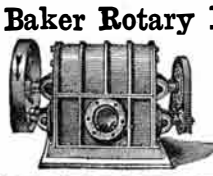

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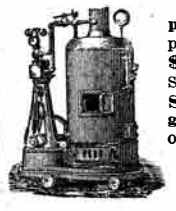

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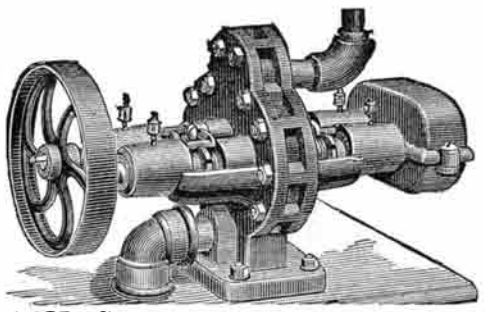

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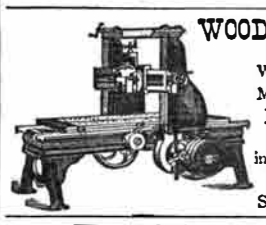

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